

Appendix I. Summary of comments received on the 23 December 2003 draft of the LWP Ecoregion Document, and responses from the ecoregion planning team.

Written comments on the second draft of the LWP Ecoregion document were received from 16 people. Below is a summary of all comments received, along with our responses to them. A number of comments were “editorial” in nature, and for the most part, these are not included in the list below. A substantial number of changes were made in the final version of the document in response to comments received.

Again, EOEa greatly appreciates the time and attention that all reviewers devoted to this document and public review process. We are confident that we have addressed these comments in appropriate ways, and that the final version of this document is much better as a result.

A. List of reviewers and/or commenters on Draft 2:

Andy Backman, DCR
Paul Cavanagh, Manomet Ctr. for Conserv. Sciences
David Foster, Harvard Forest
Carol Harley, Rochdale
Brian Hall, Harvard Forest
William Hull, Hull Forestland, L.P.
Joseph Larson, Pelham
Mike Leonard, Consulting Forester, Petersham
Leslie Luchonock, DCR
Andrea Lukens, DCR
Glenn Motzkin, Harvard Forest
David Orwig, Harvard Forest
Mason Phelps, Wendell
Heidi Ricci, Massachusetts Audubon Society
Elizabeth Sorenson, CZM
Steve Ward, DCR
Joe Zorzin, Licensed Forester, Peru

B. Written comments and responses (Note: Reviewer comments have been summarized and categorized to facilitate more efficient responses; numbers in parentheses refer to individual reviewers):

1) Comments related to the planning process

- The second draft “is a very sophisticated item” and “has set very high goals”. The success of this long term plan will be judged by the results I see. (5)
- I fervently hope that this well-intentioned effort toward sustainability and preservation of natural resources can be fulfilled. (11)
- I do like the idea of a spring conference with all stakeholders, but will the bureaucracy incorporate the good and productive ideas into the final plan? (9)
- It’s unwise to forge a broad framework for ecoregion management without broader participation of conservation, recreation and tourism experts. (6)
- FSC certification and guidelines are driving the [ecoregion planning] process. This may not best serve EOEa purposes (i.e., to be seen as driven largely by this outside structure and process). (6)
- Second draft addresses many of the procedural and substantive comments submitted on the first draft...appreciative of the efforts made to increase public participation in the state’s forest management planning process and to make draft documents available via the state website. The revised draft plan and associated

public participation process is substantially improved over the previous version.

(2)

- This [document and process] truly represents a major step forward in planning and management of state lands in the Commonwealth. In particular, you have responded to the need for an open planning process that encourages public input, and this is highly commendable. (18)
- I am very positively impressed with the effort and the overall product of this project. It is long overdue and is welcome. (24)

RESPONSE: The eventual “success” of any long-term state planning effort is subject to economic, political and other factors that are largely beyond the control of the planners. However, through more public-private partnership, landowner education, and public advocacy, some of these hurdles can be overcome. The Spring 2004 Forest Forum will provide an opportunity to further discuss strategies for implementing some of the recommendations put forth in this document.

This document is primarily meant to identify and address forest management issues in the LWP Ecoregion. While other conservation, recreation, tourism and other interests should be considered in formulating a forest management “framework,” they are not the primary focus of this planning process. However, these issues and interests will be considered in much more detail as specific management plans are developed for individual state properties in the ecoregion.

The FSC certification process was instrumental in launching this ecoregion-based planning process in the state, but is not “driving” it. We believe it certainly is in the best interest of EOEA to be planning for the management of our forestland using accepted principles of sustainability, and in a coordinated, inter-agency manner.

2) Content and organization of document

- The desire to examine state lands in a broad ecologically sensible spatial framework, and efforts to forge collaborative and integrated management, are excellent developments. (6)
- Current draft is much expanded and improved from initial document. (6)
- This draft was much improved over the first draft...it contains much detail and it is obvious much time was put into producing this report. It will be impressive to have documents like this for each ecoregion in the state, and these should definitely aid in and improve management of the Commonwealth’s forests. (19)
- The section on specific issues with corresponding goals and recommendations is great start to sound management on state lands. (19)
- This revised draft seems to adequately incorporate most of the comments received by the EOEA after release of its earlier draft document. Overall, your emphasis on conservation and issues of biodiversity in the document is commendable. (11)
- Pleased that a paragraph describing cultural and spiritual values is included – these values are generally underestimated or even ignored in resource management planning. (20)
- I was struck by how important and significant the Quabbin Watershed lands are to the ecoregion and to the state. This unique significance should be summarized and highlighted in the text of the assessment. (20)
- The new guidelines for management plan MEPA Notices and review and approval by Stewardship Council could be mentioned. (17)
- Individual sections are given unequal weight in terms of scientific citations, some are citation heavy (e.g. historical trends in forest composition) some have few to no citations (e.g. Forest disturbance agents; Archaeological resources). (19)
- There is very little material in the document that specifically addresses “the coordination and improved management of the state lands within the LWP Ecoregion.” (20)

- The language in the plan needs to be consistently clear that this plan is a forest management plan and not a general land management plan. There are currently several instances in the draft where this needs to be clarified. [examples given] (23)
- Introduction should emphasize that this first assessment and future assessments and the framework are works in progress; they can be adapted and changed as conditions change, as they will over time. (22)
- Many of the values, issues, etc. identified in the LWP document will be common to all ecoregions. These should be addressed in an Introduction to the whole program. (22)
- Geology, soils, topography, water resources, and other features that do not change should all appear in the beginning of the document. (22)
- In the socio-economic section, forest based industry you might do better to not reference mills by name as this will point out your data is out of date. Perhaps a map, showing mills and industry in the New England region would be appropriate. (22)
- [The report] does not go as far as it should, regarding fragmentation, drinking water values, Chapter 61 enrollment and landowner compensation. It fails to get to the core issue – taxation of forestland in the Commonwealth. (25)
- [This] study is a good one, but relies on old liberal top-down approaches of education and expenditures of grant monies. More could be accomplished by recognizing and harnessing market forces. (25)
- It is not clear what system is being used to classify vegetation...the documents should be consistent in the classification of natural communities...and should use the system developed by Swain and Kearsley (26)
- A 2-4 page summary of the Assessment, that could be incorporated into Open Space plans should be developed (26)
- Each assessment should have a section that identifies spatial data used for the plan, and where these data may be obtained. (26)

RESPONSE: The Quabbin lands are very important, not only in the LWP ecoregion, but statewide. The wording in appropriate sections has been changed to better reflect this.

Wording has been changed to reflect the additional review steps provided by MEPA notification. Future ecoregion documents will be presented to the DCR Stewardship Council for their review, once that council is officially appointed.

We acknowledge the “unequal” use of citations in this document. This was a result of having different authors prepare different parts of the document. We will attempt to “even out” the use of citations in future documents.

We have added a new Section IX that more directly addresses the “coordination and improved management of the state lands.” We have also include additional language in the Introduction that clarifies that these ecoregion documents are meant to primarily address forest management, and not more comprehensive ecosystem management.

We have debated internally how to deal with issues, goals and recommendations that are likely to be common to all/many ecoregions. In general, we have decided to err on the side of redundancy, rather than ask readers of future ecoregion documents to refer back to previous ones. However, we may still produce a summary-type of document – perhaps when all the individual ecoregion documents have been completed - that addresses some of the larger, more state-wide management issues.

A figure showing topography has been added to the document. The order of presentation in the assessment section follows a topical outline that we probably will not change at this point. We

are trying to adapt a USFS map of sawmills and other forest-product industries for use in these documents, and will include such maps in future documents if possible.

While this document may not go as far as some reviewers would like in terms of specific assessments, recommendations or proposals, we feel that it still serves its primary purposes of identifying key issues, and providing a “framework” in which future forest management planning will occur. Further progress (e.g., in terms of changing taxation laws, harnessing market forces, etc.) will hopefully be made in the future as efforts are made to start implementing the recommendations presented in these ecoregion documents.

Text was added to address the issue of vegetation classification systems, including a recommendation that the Swain and Kearsley classification system be used whenever possible to characterize natural community types, and especially rare communities, in individual property management plans. However, it should be recognized that other forest classification systems have been in use on state lands for many years. Those systems provide the type of information that is needed to develop specific forest stand prescriptions. DWSP, DSPR and DFW managers will likely continue to use those systems

An Executive Summary has been added, as has a section on the sources of data used in the Assessment. We agree that summaries that could be directly incorporated into Open Space plans would be desirable, and hope to be able to produce such summaries in the future.

3) Forest management approach

- Document is heavily skewed towards management for timber products, and implies that the only source for timber products and economic benefits from forests are on public lands. (6)
- Does FSC or SCS require or have guidelines on the (minimum) amount of active management that must occur for certification? Decisions about how much state land should be actively managed for forest products should not be influenced by external certification guidelines or requirements. (18)
- Management of state owned forestland should not be primarily economically driven. It should set the highest standards and provide excellent examples of sustainable forestry for others (2)
- Both the type and intensity of management on state forestland should be kept well within sustainable management targets, and management decisions should be primarily driven by public interests and resource protection, not revenues. (2)
- Stronger standards can and should be developed for forest management near vernal pools on state lands, and such standards should be applied to all woodland pools with physical attributes that indicate they probably function as vernal pools even though most are not certified. (2)
- The rationale behind the DeGraaf et al. habitat goals need to be better described before adoption as ecoregional goals. Unclear why maximum biodiversity – which appears geared towards game species – should be the management goal. (6)
- If there’s a desire to create much more than the natural level of disturbance and the early seral forests that might accompany this there should be some explanation provided. Why do we need more than the natural level of forest disturbance and why should we not approach the natural level of mature forest communities? (6)
- Since later [seral] stages take many human generations to develop, more priority should be placed on identifying and setting aside land for that purpose... it would make sense to place at least a temporary moratorium on harvesting in on any state lands where the stand age is 100 years or more, pending further detailed inventory and planning. (2)

- We recommend that provisions be developed for biological conservation aspects of forest management planning. DCR should consider other criteria and procedures such as identification and protection measures for certain rare or sensitive natural community types. (2)
- Will forests be managed to create the mix of forest size classes adopted by DFW for their Wildlife Management Areas? How will that affect the current dominant "species adapted to mature forest conditions" (21)
- Clarify the recommendation "to manage contiguous older forest blocks on state land either on an extended rotation or as reserves" to indicate the need for both extended rotation stands and reserves where no harvesting will be allowed. (18)
- Since fire may be crucial in oak regeneration, the use of fire in forest management should be examined. (2)
- I didn't see anything about plantations in this document so maybe they aren't an issue in the LWP region. But if they are, plantation conversion should be mentioned. (17)
- Restoration forestry has been identified in your document as a recommended means to achieve the goal of building or enhancing ecological integrity, and it is my strong desire to see this become a reality. (11)
- Why would hemlock regeneration be encouraged with silviculture? This infers that regeneration is immune from HWA, when in fact it is just as susceptible as overstory trees to HWA. (19)

RESPONSE: Management of state lands will ultimately meet various management objectives, of which the production of forest-based products on which our society depends will be one. In some situations, that may even be a primary objective. In others, reserve establishment, resource protection, or other public interests will be the primary objectives. Some of these objectives can most easily be achieved on state lands while others (especially those related to forest product production) may be more easily achieved on private forestland. The intent of this document is to objectively identify the range of management issues, values and needs for the LWP ecoregion, and then to provide a framework for addressing those needs in a sustainable manner.

We agree that the management of state forestland should not be driven by "revenue" goals. However, as public servants responsible for managing public lands, we also believe that to do so in a way that does not consider economics and cost-effectiveness would be a disservice to the taxpayers of the state.

All three agencies involved in this management planning process are committed to protecting vernal pools on their respective properties. DWSP and DFW already treat all vernal pools as if they are certified, and DSPR has also agreed to do so. Further, all three agencies will follow vernal pool protection guidelines developed by the DWSP that go beyond those recommended by the NHESP. Language has been added to the document to reflect this commitment.

The section on habitat management goals in the document has been re-written to better reflect the more general goals of providing for a fuller range of habitat types, rather than the more specific mix of seral stages proposed by DeGraaf et al. (1992). Further, additional detail has been provided on a forest management framework (Section IX) that will address the issue of extended rotations to provide for more late seral stage forests.

Fire is a specific management tool that might be used in some situations to achieve or maintain certain habitat conditions. However, such decisions would be made on a local level, and therefore will be addressed in individual property management plans rather than in the ecoregion framework documents.

Additional language (e.g., see Issue #7) has been added to address “restoration” forestry, since this may be one means to deal with issues related to plantations.

Regarding hemlock regeneration and HWA (Issue #9) recommendations have been re-written to reflect the range of management actions that might be taken to deal with this threat.

4) Reserves

- Forest reserves are essential components of a comprehensive forest management program... We applaud the commitment to undertake a planning process leading to designation of multiple small and large patch reserves on state lands, and to partner with nonprofits and others to include appropriate adjacent lands in reserve area designations, and look forward to participating in the planning process. (2)
- It is highly commendable that EOEA is taking a proactive role in establishing an extensive network of forest reserves for the Commonwealth. (18)
- The need for significant reserves on state land where no harvesting will be allowed is particularly critical given the effort that EOEA and DCR are appropriately expending on outreach and education to private landowners with the intention of encouraging long-term forest stewardship. (18)
- No definition of reserves is provided...there should be a concise and explicit definition along with a categorical statement that reserves will not be harvested or salvaged. Size ranges of the 3 types of reserves are also needed. (6)
- An explicit statement needs to be included indicating that harvesting will be prohibited in perpetuity from Commonwealth lands designated as Forest Reserves. (18)
- Much of the potential benefit of a reserve system is lost by the notion that “a reserve system needs to be adaptive, and to retain the ability to add, subtract, and exchange areas within a landscape context...over time”. For forest reserves to provide the ecological and cultural benefits that are described in the draft, it is essential that they be set aside in perpetuity with a consistent policy prohibiting harvesting and other active manipulation (18)
- A long-term commitment to a network of reserves dedicated to allowing natural processes to unfold in the absence of active management needs to be made explicit in the document (18)
- Once an area is designated as a reserve it should remain so, not exchanged or subtracted later. (19)
- Reserves should be set aside permanently, in part to allow development of old-growth characteristics. Concerned that “adaptive” nature of reserve selection and retention is too susceptible to winds of political, economic and social change. Perhaps sell logging rights on reserves. (16)
- What is a “matrix reserve”? (16)
- There is no basis given for the 15% figure used for identifying forest reserves – also, the special roles of the Quabbin lands and other large contiguous holdings need to be assessed relative to this issue – actually, how can any across the board estimate be given for how much land should be identified as forest reserves without a more detailed assessment? (20)
- It is unclear why SCS goals (i.e., 15% of state forest system dedicated as reserves) are being adopted – these should be viewed as minimum requirements; beyond that, EOEA should set long-term goals for the forest reserve network, based on substantial input from an open public discussion of management options for state lands (18)
- What is the rationale for dedicating more than 15% of the state total to reserves? Why not 20% or 30%? (19)
- EOEA planning goals [regarding reserves] should not be determined by FSC or other external organizations. (18)

- Reserves: Should not imply that reserves interest is driven by certification, but rather by public interest, scientific information and managerial objectives. (6)
- Reference to TNC work on matrix forests is confusing since that work is not focused on unharvested reserves. (6)
- The emphasis on TNCs methodologies confuses the issue of reserves since most of these lands are expected by TNC to remain as ‘working forest’ and as such do not represent reserves comparable to those being proposed by EOEA (i.e., where natural process will dominate and harvesting will be prohibited). (18)
- Linking Reserves discussion to their importance to active management reinforces impression that the document is driven by interest in resource production. (6)
- The various reserve-like areas managed by the different agencies are actually managed quite differently. It is therefore confusing to discuss them as though they were all true reserves. “Long rotation” and “late seral” are not synonymous with “reserve.” (6)
- There is a lack of consistency in approaches to ‘reserve areas’ adopted by the various groups cited in this section. For example, previous efforts by DSPR, DWSP, and DFW have varied levels of restriction on harvesting in areas that may be perceived as part of a ‘forest reserve system’. (18)
- The level of protection on existing DSPR, DWSP, and DFW ‘reserves’ (including DSPR ‘protection’ forests, DWSP ‘areas of special management restrictions’, and DFW ‘late-seral forest habitat’) should be indicated in the document and distinguished from reserve areas where harvesting will be prohibited (18)
- The idea of adding, subtracting and somehow exchanging reserve areas within a landscape makes no sense and should be eliminated from this report. (19)
- The call for public-private partnership in the establishment of large “matrix” reserves is surprising. It would appear that the state is in the best position to establish such reserves immediately. (6)
- There is no rationale provided for why EOEA will not designate large matrix reserves on state lands. While this may not be feasible in some ecoregions, it is certainly practical in the LWP where there are extensive, contiguous tracts of public land. In fact, the best opportunity for such large reserves probably occurs on DWSP lands in the LWP. (18)
- The issue of management of Quabbin and other water supply lands is directly relevant to the question of whether the Commonwealth will designate large matrix reserves on state-owned land. I agree with the previous reviewer that the need to create a ‘protection forest’ to protect water quality is not demonstrated in a compelling manner. (18)
- Harvard Forest’s map of 1830s forest coverage should be utilized in determining which locations may be priorities to set aside and not actively manage within site specific management plans. Where these primary forests occur on public lands, they generally should be set aside for preservation and study rather than active management (except ecological restoration management activities which may be appropriate in some instances). (2)
- The Wildlands Program also deserves mention along with GOALS zoning, and a short description of the Nature Preserves Program would be helpful. (17)

RESPONSE: Note: Many of the details on establishing a forest reserve system for Massachusetts (including definitions, size categories, official designations, etc.) will be worked out as part of the reserve planning process described in Section III. Further, many of the questions and issues that arise from such a planning process will also need to be addressed by other administrators and state officials. Thus, we are not able to give definitive responses to some of the reviewer comments at this time.

Still, it is the intent of the Ecoregion Planning Team that: 1) reserves will be officially designated in a way that provides some degree of “permanence”; 2) that extraction of wood products would be prohibited in reserves; 3) in general, habitat and vegetation conditions in reserves will be the result of “natural ecological processes”; and 4) a public process will follow to discuss what activities are appropriate in reserves (e.g., use of prescribed fire, fire suppression, invasive species control, etc.).

Some brief responses to reviewer comments follow:

The “adaptive” nature of a forest reserve system that is described in the document is intended to reflect a recognition that we cannot predict what types of issues, situations or needs might arise in the future that might alter the way reserves are viewed, “managed,” or function. Thus, some degree of flexibility must be maintained in the system to accommodate this uncertainty. The important thing is that the main purpose of the reserve system be clearly discussed and articulated, and that future decisions regarding reserves be made with the intent of furthering that purpose.

The term “matrix reserve” is used in this document to describe a large reserve that is located in, and intended to “represent,” a dominant ecosystem type. TNC has done extensive work on matrix-forming ecosystems in the northeast with the goal of identifying and conserving viable examples of each type. While the term, as used by TNC, does not necessarily preclude active forest management, our use of the term “matrix reserve” implies a lack of harvesting.

This listing of the various examples of reserve-like areas that have been designated on state lands was meant to show that efforts have already been made in the past to identify areas that for various reasons would not be managed in traditional ways. As the details of a forest reserve system are developed over the coming year, the DSPR, DWSP and DFW will re-evaluate earlier designations of un-managed lands, include appropriate ones in the new reserve system, perhaps remove some previously-designated areas that do not meet the new criteria, and identify new reserve areas.

No science exists that dictates what percentage of land should be placed in a reserve category. Simply put, adequate reserve area is needed to meet the objectives established for reserves (see above). Various references in the scientific literature suggest that 15% or so as a reasonable figure. Past experiences in zoning DWSP lands for management planning have also resulted in at least 15% of those lands being designated for no management. Thus, in the absence of other, science-based recommendations, we decided to go with the 15% figure. However, the Ecoregion Planning Team does not regard the 15% figure to necessarily represent either a minimum or a maximum amount – the final figure will come out of the separate reserve planning process referenced above. Likewise, it should be noted that in any one ecoregion, we anticipate that between 10 and 20% of the state lands will be in the reserve category. On individual properties, the percentage could be even higher. It should also be noted that the 15% figure was an old SCS standard that is no longer being used now that new FSC standards for the northeast have been finalized.

While we acknowledge that state lands offer the best opportunity to establish a system of reserves, it is also important for conservation organizations and other private landowners to contribute to this system. It is important to represent the full range of ecological diversity within a system of reserves, and the best, and/or the most viable examples of this diversity may or may not exist on state lands. Recent budgetary cuts to many state programs demonstrate that issues such as land conservation cannot be left to the state alone. Public-private partnerships in land conservation and other environmental protection programs have become the new way of doing business in Massachusetts, and this will likely continue well into the future.

A number of changes have been made in the text of the document to further clarify some of the issues raised by reviewers, as well as the intent of the Ecoregion Planning Team in terms of reserve establishment and maintenance.

5) Need for more information

- Provide more details on why a hybrid ecoregion classification system was chosen - besides “finer delineations necessary for management planning processes” (19)
- Further clarification is warranted as to why a hybrid of the US Forest Service and EPA ecoregion maps was determined to be necessary... Since recent EOEAs planning efforts have used the EPA ecoregion map, so the specific benefits of adopting a different base map for this planning exercise should be clarified. (18)
- There needs to be a discussion in this document – in addition to the forthcoming outline regarding improved coordination and integration – that more specifically outlines how this broad ecoregion perspective can or will be applied to specific state-owned lands. (20)
- In order to adequately evaluate Issue #20, readers need some idea of what target level of production EOEAs is proposing. Although that information will undoubtedly appear in individual forest management plans, some of this information must be included in this document in order for readers to be able to understand and adequately comment on proposed EOEAs actions. (18)
- The main findings of the SCS audit... should be made publicly available – the public should be informed not only of EOEAs’s proposed future action, but also of the results of an independent review of the current and past state of affairs of each of the land management agencies (18)
- The FSC 10 Principles, Criteria, and regional guidelines (Indicators) mentioned should be included as appendices. In particular, "The current draft (7.7, June 2002) of the FSC Certification Standard for the Northeast Region of the US is the FSC standard for Massachusetts," should be included. (21)
- DFW’s "existing forest management guideline for state wildlife management areas" should be appended as well. (21)
- CFI data from state lands should also be summarized, given the large number of CFI plots within the LWP ecoregion. (18)
- The description of the forest types was very over simplistic... you should reference to the complexities and combinations of mixed species forests. Use information from “Silvics of North America...” forest typing information done by DWSP, referenced plant community records, etc. (22)
- The “current system of unmanaged lands within DWSP properties” that is said to “meet FSC requirements” needs to be included - its criteria, process, restrictions, etc. (21)
- Human infrastructure effects on the region – e.g., major roads, power lines, rail lines, dams, etc. – should be addressed as these all have edge effects and can serve as barriers or facilitators of species movements and or introductions. (22)
- Describe the agencies’ functions in relationship to the lands they own, what they are managed for (e.g., water supply, wildlife, etc.), how they are funded, their mandates, etc. (22)
- There should be some recognition that [recent efforts to develop new technologies to utilize low market value forest products] could have a massive impact on our forests and a plan with vision should at least identify this as a future impact. (24)
- The Glossary needs to address the terms “restoration forestry” and “forest reserves.” (24)
- "sprawl front" is not adequately defined or described (20)
- "Matrix" needs to be defined - p. 14 mentions TNC's "matrix" forest communities, bottom of p. 15 mentions "management of the matrix lands surrounding a reserve

that are open to wood products extraction." These are different uses of "matrix" aren't they? (21)

- Our Massachusetts resource inventories are not as comprehensive as they should be, nor as accurate and up-to-date. Increased efforts to inventory what we now have, before it is destroyed, are needed. (11)
- The fifth goal listed in the Introduction needs to be explained more clearly, especially the clause regarding private forest landowners. (20)
- In order to implement any of the recommendations in the Issues, Goals and Recommendations section, an action plan - with recommended actions, responsible parties, and a timescale - should be incorporated, including discussion of the inter-agency decision-making structure or framework. (21)

RESPONSE: Recent discussions with USFS and other researchers using ecoregions have resulted in further refinements to the ecosystem classification system. As a result, we no longer require a "hybrid" classification system, but rather have proposed using the revised USFS system.

A new section (IX) has been added to address how the information included in these ecoregion documents will be used to guide forest management on specific state-owned lands. However, no target levels of production are being proposed in these ecoregion documents, although individual property management plans may include such figures.

The results of the SCS audit of Massachusetts forest management, along with further details on the FSC principles, criteria and regional indicators related to forest certification, will be available in Spring 2004, when it is anticipated that the audit report (now in draft form) will be finalized and released to the public. We do not think it's necessary to append documents such as DFW's forest management guidelines for state wildlife management areas. However, a reference to an online version of that document is included in the text.

The intent of these documents is to describe the general forest conditions within each ecoregion, and not to attempt to describe the "complexities and combinations of mixed species forests". When data is available to do so across the whole ecoregion (e.g., using USFS FIA data), that is what we will use. In some cases (e.g., for smaller ecoregions in which there are not enough FIA data points to provide a meaningful analysis), that data may be supplemented with CFI or other locally-collected forest information.

Additional detail on the "current system of unmanaged lands within DWSP properties" will be provided in the specific management plans for those lands. Again, it is not the intent of this ecoregion planning process to include that level of detail in this document. [Also see responses to comments on Reserves]

We agree that human infrastructure can have important ecological impacts and have added a new figure and associated text dealing with this subject.

New information about the functions and management approaches of 3 main land management agencies has been added to Section VIII.

New text has been added to Section VII to address the potential impacts that new technologies to utilize low market value forest products could have on future forest management activities.

The Glossary has been updated to include additional terms requested by reviewers.

We believe Massachusetts has made great strides in inventorying its natural resources in recent decades, but much additional work could be done. Much of this work can and will be done in conjunction with the development of individual management plans for specific properties.

We've added wording in Section IX that reflects the need for good inventory data when developing these plans.

Wording has been changed in the Introduction to clarify the intent of the 5th listed goal statement.

These ecoregion documents are not meant to be "action plans" per se, but rather more general management "frameworks" within which the more specific management (or action) plans will be developed. However, we have added additional text that addresses the inter-agency coordination and management planning processes.

6) Carbon sequestration

- There is not a lack of information on carbon dynamics as document implies. (6)
- It's unclear how useful the carbon sequestration recommendations are...that deserves further study and discussion. (2)

RESPONSE: The main point here is that not enough is known about how the forest management activities planned for state lands would affect carbon cycling and sequestration to make definitive statements in this document. Wording has been changed to more clearly reflect this. Further, the goal and recommendations related to this topic have been removed from the document since we believe that actions related to carbon sequestration are not justified at this time.

7) Policy and goal-related comments

- One comes away with the impression that important management goals and policies are being determined by or strongly influenced by FSC and/or SCS requirements or guidelines. Instead, EOEA must determine appropriate goals and policies for state lands, which may well differ from or go beyond the FSC/SCS standards. (18)
- Too much emphasis is placed on need for young forests, and biodiversity goals. Should rethink the "diversity-at-all-costs" philosophy. Mature forests should be considered as asset, not a liability. (16)
- Management goals seem to be greatly constrained by pre-ordained guidelines (e.g., from FSC guidelines, DeGraaf et al. habitat goals, constraints of individual property management plans). The new ecoregional thinking and agency collaboration should be an opportunity for new and more insightful thinking, goals and guidelines...To fall back on established approaches when new thinking is required is to guarantee that only old solutions will emerge. (6)
- It remains unclear precisely what the [biodiversity] targets are and how the ecoregional plan will contribute to achieving those targets. Targets for the amounts of early vs. mid vs. late seral stage coverage need to be identified and more specific guidelines developed on how to select which areas should be targeted for various seral stages (2)
- The forest composition/structure guidelines that DFW has adopted (DeGraaf et al. 1992) appear skewed towards young stands with relatively small trees...the amount of large sawtimber to be retained (<10%) seems inadequate given the stated objective of using natural disturbance processes as a model for guiding forest management to diversify landscape conditions. There is a need to plan for substantially more older forest than the minimum acreage selected for late-seral types. (18)
- Are there goals for amounts of early seral and late successional habitats? For reserves? Also will "salvage logging" be prohibited from reserve areas to ensure they are indeed reserves? (19)

- Why would domination by mature forest species be a negative condition for an ecoregion that has been dominated by mature forests for thousands of years? If there are specific human values that are driving the desire to have more early successional species and conditions these should be explained. (6)
- Is it an implicit underlying goal of this document to increase forest harvesting in this ecoregion and throughout the state? If so, this goal should be stated clearly and upfront. (20)

RESPONSE: Setting goals for forest or wildlife habitat conditions is largely a subjective, value-driven process. The general habitat guidelines proposed by DeGraaf et al (1992) are meant to provide a range of conditions that would meet the habitat requirements for a broad assemblage of native wildlife species. However, setting such goals still reflects value-based decisions about what “mix” of species is most desirable. We agree with several reviewers that these guidelines tend to favor more early successional habitats and species at the expense of late seral stages. Accordingly, we have revised the section of the document dealing with habitat goals to provide a more general set of goals that affirms the importance of both early and late-seral stages, but without setting specific percentage goals. More specific habitat goals will be addressed in the individual property management plans.

While it is not a specific goal of this document to increase forest harvesting, we anticipate that as management goals and especially plans are developed over the next few years, a corresponding increase in harvesting activity will also occur. It should be noted that the DWSP has been actively managing its watershed lands for many years, and the DFW has also been ramping up its management activity recently. As the DSPR starts preparing its property management plans, it is only reasonable to assume that their forest management program will also shift into a higher gear. All of this should not be cause for concern however, since this increased management activity will be occurring in a context of more comprehensive planning in which reserve areas will be identified and protected, habitat goals (developed with public input) will guide management activities, and principles of sustainability will be adhered to.

8) Socio-economic factors

- Unclear why energy use and needs are discussed in document. Wood production will have little impact on energy. Discussion of production:consumption should not proceed without consideration of (1) conservation of resources, (2) consumption, and (3) private forestlands. (6)
- Tourism and outdoor recreation are given short shrift...emphasis on hunting, fishing and trapping is bizarre in a state and region where hiking, camping, biking, kayaking, leaf-peeping, birding, etc. engage many more people and generate substantially more economic impact. (6)
- Inadequate recognition given to the non-forestry aspects of management planning for state-owned lands, e.g. all the considerations for recreation, facility rehab and improvement, staffing etc. Most of the DCR properties in the LWP are popular visitor destinations with many non-forestry management / operations issues. (17)
- I realize this is a forestry document, but the Outdoor Recreation section seems a bit slim. (17)
- It seems important to include data on non-extractive uses of forestland in the region (i.e., outdoor recreation, nature centers, hiking trails, etc). This information and perspective is critical for setting policy and management guidelines for EOEALands. (18)
- The section on socio-economic factors was informative but weighted heavily to forest industry. Consider mentioning trail networks, visitation numbers (e.g. >700,000 per year for Wachusett mountain alone!), ski areas, fly-fishing only

areas, license agents, number of hunting and fishing licenses purchased etc. etc. (19)

- The emphasis on forest products and their industries seem quite overblown. Why not chart up the bed and breakfast places, the bookstores selling field guides, the miles of hiking trails, etc? (6)
- Other values of forests – recreation, tourism, water production, biodiversity, etc. – are of much greater public interest and economic importance, and should be given more attention (6)
- What is the current policy on ORV/ATV use on state lands? In order to reduce damage from ORV/ATV use, ORV/ATV use should be prohibited on state lands other than on a small number of designated trails. (18)
- Illegal use of ORVs not only adversely impacts soil and water conditions, but also negatively affects wildlife and passive users of the state forestland. We support the recommended actions on this issue, including increased enforcement in cooperation with local police and landowners of parcels adjacent to DCR lands as well as education through ORV user groups and retailers. (2)
- DCR should document ORV damage on state lands and track damage and recovery over time, in order to track the extent of the problem and evaluate success or failure of efforts to address this issue. (2)
- The response to the reviewer suggestion that EOEa should advocate for reduced use of wood products somewhat misses the point: it is important for EOEa to advocate for an increase in the percentage of wood and energy products that are produced locally and to advocate for an overall reduction in resource use, such as occurs with increased recycling, resource conservation, etc. (18)

RESPONSE: We believe that it is appropriate to address energy use and needs in a forest management planning document, especially in light of the recent attention given to the use of new technologies that utilize low market value forest products, including several existing or proposed facilities in or near the LWP ecoregion. It is estimated that as much as 250 MW of electricity could be sustainably produced from low value wood products in Massachusetts. Such developments could have a significant effect on the local forest management, both on public and private lands, and provide further justification for a comprehensive planning process such as this one.

The other values of forest ecosystems - tourism, recreation, etc. - have been identified in this document, because they are important considerations in forest management planning. However, the extent and relative importance of these activities varies greatly across the many state-owned properties. Therefore, they will be dealt with in more detail in the individual management plans for specific properties. Still, as new ecoregion documents are developed, we will include additional information on recreation and other non-harvest uses of the forest ecosystem if it is readily available.

ORV usage, policies and issues are also highly variable across the various state-owned properties, and are also most appropriate to address on an individual property basis.

We agree with the reviewer's comment about the need to advocate for increased recycling, resource conservation, etc. Other programs within EOEa and its agencies more directly deal with this issue.

9) Public-private partnerships

- State should not have any involvement in Massachusetts Woodland Cooperative since it directly competes with private foresters. (9)

RESPONSE: The DSPR is supportive of efforts such as the Massachusetts Woodlands Cooperative, which are designed to improve the long-term management of forests in Massachusetts. Recently, the level of involvement with Massachusetts Woodland Cooperative has been reviewed. DSPR is providing services that are customary to all and provided equally to all landowners and those interested in forestry in Massachusetts.

10) Accuracy comments

- Citation for the 1830 forest map should be changed. Projection of the map also needs work. (16)
- Some of the discussion about pre-European settlement forest conditions should be reviewed and changed. (6)
- The statement that "the principal focus of this document is the coordination and improved management of the state lands within the LWP Ecoregion" does not seem supported. There is a lot of material regarding forestry and private forestry - and actually, relatively not that much about state lands. The document should have two principal focuses - the state owned lands and the private forestlands. (20)
- I don't believe it is accurate to say that forest management planning is all that is needed for areas that are forested (page 22). Most of these lands are part of multiple-use properties, with complicated demands being made for their protection and use. (23)

RESPONSE: The citation for the 1830 map has been changed, with our apologies.

While this document is meant to address conditions, issues and needs for both public and private lands in the ecoregion, the management framework section primarily addresses state land management. It is hoped that private landowners will also review the ecoregion documents when making management decisions for their lands.

Wording has been changed to remove the impression that forest management planning is all that is needed for multiple-use forested areas.

11) High-grading

- If state owned forests are to be the models of sound silvicultural practices, why not state that high-grading is and will be prohibited from all state lands? (19)

RESPONSE: We agree that forest management on state lands should be a model of sound silvicultural practices; a statement to this effect has been included in Issue #6 and in Section IX.

12) Economic issues

- It is crucial that flow of timber harvest dollars to state and municipal coffers not unduly influence land management decisions. (2)
- Clarify the recommendation to "fully implement sustainable forest management plans for all state ownerships over the next 10 years and thereby significantly increase the amount of payments to local communities with DCR, DSPR land"; does the potential for an increase in payments to local communities result from an anticipated significant increase in harvesting? If so, this needs to be stated explicitly, with real opportunity for public discussion and input. (18)
- I would like to sound a note of caution about encouraging the use of forest products to enhance municipal revenues. This approach has led to disastrous consequences

in other parts of the country and we should absolutely not go down this path in the Commonwealth of Massachusetts. (11)

- The issue of PILOT payments (Issue #14) should not be linked to creating incentives for more forest harvesting and possible increased town revenues (20)
- The values of forests in contributing to ecosystem service values should be further considered in the context of economic issues surrounding public and private forestland management. (2)
- ...the worthy goals and recommendations will mostly never be accomplished due to inadequate financial support (25)

RESPONSE: We agree that land management decisions should not be driven by economic considerations. However, we also believe that it is imperative that more effective ways of compensating municipalities that contain state forestlands must be found - hence our recommendations related to dedicating more timber harvest revenues to the towns in which that revenue is generated. As discussed in the response to comments category 7), we anticipate that the development and implementation of forest management plans for state properties will result in increased forest management activity on those lands. This will also result in increased revenues, which we believe should be shared with host communities in a more equitable manner. As long as that management is conducted according to plans developed with public input and according to principles of sustainability, ecological consequences can be easily avoidable.

The concept of valuing ecosystem services is certainly worthy of further consideration. However, quantifying these “services” is beyond the scope of this document. Please refer to the new Massachusetts Audubon publication “Losing Ground: At What Cost?”

We recognize that many of the recommendations put forth in this document will be difficult to achieve, especially during tight budgetary times. However, a number of the recommendations do not require money, and we will attempt to pursue as many of these as feasible.

13) Bureaucratic or operational changes and needs

- State should support various bills currently in Legislature aimed at making changes in Chapter 61/A/B, including repeal of 8% stumpage tax and right of first refusal. (9)
- Legislation is needed that requires that only licensed foresters can prepare Forest Cutting Plans. Those plans should be posted on the internet for public review and inspected by FLB. Service Forestry program will no longer be needed. (9)
- Forester Licensing Board needs to be reconstituted to represent true interests of landowners and forest. (9)
- Forester Licensing Law needs to be enforced better (9)
- The commonwealth should continually reaffirm its commitment to truly sustainable management that maintains the full range of forest community types and an appropriate mix of all seral stages including a significant component of forests more than 100 or even 150 years in age. (2)
- The low level of forest cutting on state lands and the lack of such basic professional elements as forest management plans has become a matter of public notice and discussion. One must look at the internal organization and effective use of the professional forestry staff for clues to these problems, yet the report does not seem to do this. (24)
- There appears to be less than effective use and supervision of the professional forestry staff [in DSPR]. For example, forester assignments have not been commensurate with the forest area to be managed; field foresters have not had a

clear reporting line to the Chief Forester. If the objectives and benefits of green certification are to be achieved attention needs to be paid to organizational structure. (24)

RESPONSE: In reviewing changes to Chapter 61 we need to consider the point of view of landowners, local communities, private foresters and the state, all of whom have an interest in working forests. Local communities greatly value the local revenue derived from the product tax, especially given the significant re-distribution of local tax revenue that Chapter 61 can cause. Local communities and land conservation organizations also rely on the Right of First Refusal to keep land in forest cover when land is withdrawn from the program. Without this provision, much working forestland would be converted to developed land uses. Landowners often need the revenues derived from forestry operations to be able to keep their land in forest cover. These issues will be discussed with representatives from these groups at the upcoming spring Forest Forum. A working group will be formed to recommend changes to Chapter 61.

Current laws and regulations define the role of the Bureau of Forestry and the requirements of preparing Forest Cutting Plans. Cutting Plans are available upon request and to date are not posted on the website due to the cost and time to undertake this suggestion. The Foresters Licensing Board is not required or authorized under present regulations to review all cutting plans. The Service Forestry Program is necessary to administer the Forest Cutting Practices Act.

The composition of the Foresters Licensing Board currently meets the requirements of the Forest Cutting Practices Act. New legislation or changes to the regulations would be necessary to change the interests of landowners or other groups on this board. The Bureau of Forestry is administering the Forest Cutting Practices Act (Forester Licensing Law) to the best of its ability. Recent retirements, leaves of absence, and reductions in staff are all affecting the Bureau's ability to provide the regulatory oversight necessary to meet the intent of the regulations.

The Commonwealth, through this landscape assessment and site plans, has demonstrated a long-term commitment to sustainable forest management that maintains the full range of forest community types and an appropriate mix of all seral stages including a significant component of forests more than 100 or even 150 years in age. The "green certification" process also demonstrates a further commitment to long-term sustainability in accordance with the "Final Forest Stewardship Standard for the Northeast Region June 6, 2003."

Forest management plans for state forests that balance ecological, social, and economic considerations are being developed. A goal of the Bureau of Forestry is to increase, in a responsible manner, the management on State Forests over time. Text has been added that more specifically defines the type of sustainable forest management that the three land-managing divisions practice or envision.

Text has been added to clarify that the completion of ecoregion documents for the state will be followed by property management plans for the 500,000 acres of forests under the management of the three divisions. These property plans must all be completed over the next five years in order to stay in compliance with FSC Forest Certification and it is our intent to complete the plans in this timeframe.

The DSPR has hired a new Chief Forester who is implementing a staffing re-organization to more effectively and efficiently utilize existing management and service forestry staff. Recent changes also require all foresters to report directly to the Chief Forester rather than the Regional Parks Supervisor, which helps keep the foresters' duties focused on forest planning and management.

14) Private land stewardship

- The pilot project to use private sector foresters to implement a state forest management plan is a step in the right direction. Revenues generated should be put in a Forest Management Trust Fund, with a board (including NGO members) overseeing expenditures. (9)
- The document deals exclusively with state lands, and minimized the role of private lands. (6)
- There is little discussion about private land management. There is a need, at the minimum to identify the values and the issues surrounding management of private lands and to highlight some of the ways in which the state agencies attempt to and could increasingly reach out to these lands and their owners. (6)
- We support the state's efforts to improve the sustainability of private forestland management through landowner education, incentives such as improvements to the Chapter 61 program, and improved administration of the Forest Cutting Practices regulations. (2)
- We support recommendations on increasing incentives and education to encourage more landowners to participate in Chapter 61 and to maintain the viability and sustainability of forestry on private lands, and we urge the commonwealth to target communities in sprawl frontier areas for technical assistance with growth management. (2)
- The contact I have had with the state [as a Chapter 61 landowner] has been almost exclusively notices of when I have to renew my forest management plan and virtually nothing on avoidance of high grading or encouragement or education toward better management practices. I suggest that the report consider inclusion of periodic meetings for Ch 61 landowners as one means of education. (24)
- The private landowner has too little incentive other than goodwill to support the recommendations [in this report]...Can't expect landowners to respond positively to proper forest management practices and policies when the financial carrots provide little or no incentives. (25)
- In the North Quabbin region there was an initiative to get abutting private forest landowners to collaborate/communicate regarding stewardship of their lands. If this has been successful, it might be worth a mention under this Issue. (17)
- Solution is to tax Massachusetts forestland based on its productive potential as forestland...why can't this be talked about, listed as a study recommendation and ultimately accomplished? (25)

RESPONSE: It is clear that there is substantial interest in the state becoming more involved in forest management on private lands – especially regarding education and incentives. As stated previously, the intent of this document is to identify the issues and needs for the whole ecoregion (i.e., both public and private lands), but then to focus primarily on management recommendations for state-owned lands geared towards addressing those issues. Still, we believe we have proposed a number of meaningful recommendations focused on private land forest management (more than half of the Issue statements include private land recommendations). While many of these are of an educational nature, we are also committed to pursuing regulatory changes (e.g., that could lead to a decrease in high-grading on private lands) and especially landowner incentives.

The Forest Stewardship initiative, funded by EOE, has already offered free stewardship plans to the owners of over 500,000 acres of private forestland over the past two years. Mailings to those landowners have also included information about managing private woodlots and about assistance that is available beyond the offer of a free plan. To date, over 450 individuals owning over 30,000 acres of private forestland have requested a stewardship plan. Many of these plans are already completed and the remaining plans will be completed by local private

professional foresters over the next several months. A significant part of this effort involved the northern section of this ecoregion where dozens of stewardship plans are being completed. EOEA hopes to continue this effort and expand it to other parts of the state, including areas threatened by sprawl development. During this past fall, several towns in the Nashua River Watershed were added to the program, in partnership with the Nashua River Watershed Association. This effort has resulted in a surprisingly strong response from landowners in this high growth area.

The Forest Stewardship program links with a recent effort to conserve over 9,000 acres of forestland in this region via conservation restrictions paid for by the state in coordination with the Mt. Grace Land Conservation Trust and the New England Forestry Foundation (NEFF). NEFF is also in the midst of a major forest owner outreach and education program in this region funded by the Ford Foundation. These ongoing efforts show that there is a major emphasis on private forestlands within this ecoregion.

Regarding the issue of taxation of forestland, we have already proposed (see Issue #14) that alternative means of taxing open space be explored. However, this issue goes well beyond our ability as land management staff to make those changes. Significant citizen support for such a change will be needed. EOEA supports Senate Bill 1196 (Forest Products Trust Fund) that would set up a dedicated fund for timber revenues within DCR and sharing this revenue with local communities.

The upcoming spring forestry forum will focus largely on private forests and efforts to strengthen sustainable forest management. These discussions will result in recommendations that will aim to strengthen markets and incentives for sustainable management of private forestlands.

15) Land Conservation

- The final report should include recommendations for the commonwealth to acquire and assist others with permanently protecting lands within sprawl frontiers that are identified as high priorities for protection within the State Land Conservation Plan.
- The discussion of the protective value of Article 97 fails to point out the long history of easy and non-contested legislative approvals to remove this protection from open space by communities whose legislators file the requests as “home rule” issues. Article 97 protection has been proven to be very weak and the report should not give a contrary impression. (24)
- The current EOEA/MA Audubon 20-year land conservation initiative should be mentioned (17)

RESPONSE: Language has been added in Issue #3 that address the use of the “Statewide Land Conservation Plan – A Partnership” to prioritize land conservation efforts. This plan was a joint effort of land trusts such as the Massachusetts Audubon Society and other land trusts with EOEA land staff. Even with lower state land acquisition budgets during the current fiscal crisis, innovative techniques are being used to protect high priority land. For example, over \$65 million of land value was protected in Fiscal Year 2003 by EOEA, land trusts and municipalities. This figure is higher than that protected in FY-02, even though the EOEA land budget was reduced from \$32 to \$18 million during this period. This shows the tremendous ability for local land trusts and communities to protect land in innovative ways. In FY-05, EOEA will utilize whatever land budget it secures to try to again leverage other resources to protect key parcels, especially in sprawl-threatened areas.

Article 97 protection of state land can be overridden by a 2/3 vote of the legislature and this does occur on several, usually small, parcels at the very end of each legislative session. EOEA supports Senate 1254, sponsored by Senator Resor, to limit dispositions of Article 97 land and

require replacement of any lost land with land of equal or greater natural resource value. This is also one of the top priorities of the Massachusetts Audubon Society and more information is available on this bill on their web site (www.Massaudubon.org).

16) Invasives

- Although invasives are a potential problem the emphasis on the subject here seems out of proportion. There is no evidence provided that invasives really are a major problem in the LWP or Massachusetts's forests. The LWP data presented is not compelling...even 325 total occurrences frankly seems trivial... since no action proposals are forwarded it is unclear why invasives have such a prominent position in the document. (6)
- Citing another white paper verbatim is unsatisfactory (6)
- The role of forest disturbance, including harvesting, road construction, etc. on the establishment and spread of invasives should be noted and discussed in this document (6)
- The revised draft improves and enhances the discussion of invasives in several respects. However, more specific recommendations are still needed to minimize introduction/spread of invasives potentially associated with forest management related disturbances. There is also a need for more proactive efforts, in cooperation with other states and the federal government, to prevent the introduction of new and potentially devastating invasions of insects and diseases. (2)
- Consider adding the following to HWA section: plans for evaluating and planning for hazard tree removal in or near high public access areas such as picnic areas, heavily traveled trails, campground, etc; consider planting species in understory prior to overstory hemlock death. (19)

RESPONSE: The data presented to support the concern about invasives in the LWP is just the preliminary data from the Invasive Plant Atlas of New England project. This is a relatively new effort that has recently received additional funding to train an army of volunteers to carry out standardized documentation of existing invasive plants. The NHESP also maintains extensive files on invasive plants, although these have not been methodically quantified for frequency or distribution of occurrences, with the exception of botanical inventory reports for Quaboag and Palmer WMAs. Bruce Sorrie and Paul Somers (past and current State Botanists) address the widespread presence of invasive species in Massachusetts, in their book "The Vascular Plants of Massachusetts: A County Checklist". The commenter is correct that the hard data is still being assembled to back up concerns about the spread of invasive plants throughout Massachusetts. However, the problem of invasive plant species in both disturbed and minimally disturbed habitats has been widely articulated and is considered by many groups and state agencies to be among the most pressing ecosystem issues facing us today. This landscape assessment for the LWP ecoregion devotes 1.5 pages of introductory text, one graph, and a 2-page appendix to the issue, which does not seem excessive to us.

There is no question that only a fraction of the landscape has been methodically surveyed to document the presence of invasive plants in the forest. Yet within that small fraction, there is frequent and disturbing evidence of the problem.

We do not disagree with the comment that disturbances, such as timber harvesting and road building, can exacerbate the invasive species problem. Clearly, disturbance provides fertile ground for these species, which are aggressive reproducers capable of tolerating and thriving in a wide range of habitat conditions. However, the problem is invasive species, not harvesting or road building. Disturbance often reveals the problem, for example when wind damage releases an accumulated soil bank of invasive plant seed, but it does not cause the problem.

We agree with the comment that the issue was identified without action proposals, so we have also added an Invasive Plant Issue (#8) to the final report, with goals and recommendations for action, including greater cooperation between state agencies and NGOs in monitoring and addressing invasions.

A new Issue statement (#9) has been added to address the range of management options that might be used to deal with HWA infestations. However, the specifics regarding control measures will be addressed in individual property management plans.

17) Management of specific state properties

- Draft 2 is dismissive of questions raised on first draft regarding management of MDC lands (Reviewer fundamentally disagrees with rationale for that management). (6)
- The perceived need for active management to protect water quality is not a valid reason to preclude EOEA from designating Quabbin or other water supply lands as large matrix reserves. (18)
- We urge caution in achieving the appropriate level of management and balance with other interests and uses on state lands. Many DCR properties were acquired primarily for their ecological, scenic, or recreational attributes and its landholdings contain more documented rare species occurrences than any other landowner. (2)
- The exact mix and location of managed vs. unmanaged state owned forestland is a complicated subject that will require careful effort as site specific management plans are developed. (2)

RESPONSE: Again, the intent of this document is not to make decisions regarding the management of individual state properties, but rather to provide a general management framework in which more specific management plans will be developed. The questions about the management of the Quabbin watershed lands will be discussed as part of the planning process for those state lands, which will be occurring later in 2004. Those questions might also be addressed during upcoming discussions about establishing a system of forest reserves in the state.

We agree that an appropriate balance between management and other interests and uses must be found for state lands. Again, the time for discussing those issues is when the individual management plans for specific state properties are developed. Much of that planning will occur over the next 3-5 years.

18) Forest fragmentation

- I continue to take issue with the inclusion of the statement about forest fragmentation not being a major issue at the present time. Other wording in the document appears to refute this. If you insist on including the statement that it is “not an issue at this time,” it should be cross-referenced to other pertinent information in the document. In reality, fragmentation is increasing and is definitely an issue in the ecoregion, particularly in the easternmost parts of the region. (11)
- I don't think this statement that forest fragmentation is not a major issue at the present time is adequately justified or supported - aside from perhaps the Quabbin lands, I don't think I would agree with it. (20)

RESPONSE: We continue to believe that in comparison to other parts of the state, forest fragmentation is not a pressing environmental issue in the LWP ecoregion as a whole at this time. This may be due in large part to the significant amount of protected land in this ecoregion. However because the average “unfragmented” forest parcel is likely larger in this

ecoregion than any other region with this proximity to Boston, we agree the time to think about the impacts of fragmentation is now. Further, we have changed the text in appropriate places to further reflect the concern that fragmentation may be a serious issue in some portions of the ecoregion.

19) Water resources

- There is little acknowledgement in these management documents of spatial variability across watershed lands in the ability to impact (positively or negatively) water quality. (18)
- Since the report indicates that one of the important objectives of state forestland is to ensure high quality water, I believe that some acknowledgement of the impact of excess road salt application on ground and surface water quality should be made (Ex. Route 202 in Pelham contaminating domestic groundwater supplies and a tributary to the Quabbin Reservoir). (24)

RESPONSE: It is well beyond the scope of this document to identify and describe the spatial variability in the ability of the watershed lands to impact water quality. However, to the extent that this is possible on a more local level, the individual management plans for specific state properties will further address this issue.

We have added text in a new section on ecoregion infrastructure, and as a recommendation for Issue #10 on the potential impacts of road construction and maintenance on water supplies. For the Quabbin Reservoir, the road salt issue is discussed in detail in the Quabbin Watershed Protection Plan produced by DWSP.

20) Comments on Issues and Recommendations

- I strongly disagree with the Issue #1 statement: “The management of these areas should meet multiple resource objectives.” If it is policy, it should be more clearly stated as such. And as a broad policy statement, I strongly disagree with it – resource management objectives should be based upon the goals, needs, assessments and priorities of specifically defined management areas. (20)
- There isn’t one mention of the word forester or licensed forester in this section on Issue #3. (19)
- Recommendations for HWA (Issue #8): need to clarify why ‘salvage harvests at pre-defined stages of infestation’ may be desirable. (18)
- Stronger, clearer and more comprehensive measures are needed to address Issue #10 than the two recommendations listed (20)
- Highlight the Biomass conversion project at Mount Wachusett Community College as a great example in Issue #12. (19)
- The goal and recommendation in Issue #18 don’t address the compensation part...the goal should be to strive towards some type of compensation rather than a general awareness or appreciation of the public...perhaps the forest conference that is listed in the recommendation could address potential compensation avenues. (19)
- Issue 18: Although the Goal and Recommendations are commendable, it’s not clear how these will help address the issue of landowners being poorly compensated for forest services. (18)
- There should be a recommendation for using the interface between the public and the forest, i.e. public visitation to DCR and other state conservation properties, as an important avenue for public education on forest management. (17)

RESPONSE: The “multiple resource objectives” statement in one of the Issue #1 recommendations refers to reserves and areas of extended rotations. We still believe that these areas can and will serve multiple objectives, albeit not all possible objectives.

The involvement of private foresters is implied in a number of the many recommendations listed under Issue #6 (formerly #3). However, we have changed the text in several places to make it clear that private licensed foresters are key players in efforts to minimize high-grading.

Issue #9 (regarding HWA; formerly #8) has been re-written to reflect the range of management actions that might be taken on state lands to deal with this threat.

A third recommendation has been added to Issue #11 (formerly #10) to address concerns about ORV use.

A recommendation has been added to Issue #12 that highlights the work being done at Mt. Wachusett Community College.

The suggestion to use public forests as education and demonstration areas is a good one. The DSPR is working on the planning and implementation of land and natural resource plans (forest plans) for eight “focus forests” that will serve as demonstrations of sustainable forestry across the state. The DWSP has two guided nature trails at Quabbin and Wachusett watersheds aimed at showing landowners and the general public examples of sustainable forestry practice. To the extent possible, these areas will be used for a more broad-based educational effort of forest landowners. These efforts should be supplemented by tours of well-managed woodlots by groups such as the Forest Stewards Guild and the Massachusetts Audubon Society. Collaborations between forestry and environmental organizations like this need to be expanded in the future.

The challenge of fairly compensating private forest landowners for the services their forests give to society is a difficult one to solve. Perhaps the most tangible way to deal with this issue is through amendments to Chapter 61. Making this law more attractive and amendable to the needs of landowners will be discussed at the upcoming spring Forestry Forum. Recommendations from this forum will be included in future ecoregional documents.

Appendix II. Summary of comments received on October 2003 draft of the LWP Ecoregion Document, and responses from the ecoregion planning team

Written comments on the first draft of the LWP Ecoregion document were received from 14 people. In addition, verbal comments from 5 people were recorded at the public meeting held on 9/24/03 in Athol.

Below is a summary of all comments received, along with our responses to them. In many cases, changes were also made in the second draft of the ecoregion document in response to the comments.

A number of comments were “editorial” in nature, and for the most part, these are not included in the list below. However, a substantial number of changes were made in the second draft of the document in response to these comments.

We are very appreciative of the time and attention that all reviewers devoted to this document and public review process.

A. List of reviewers and/or commenters:

Sue Cloutier, Miller’s River Environmental Center, Athol
Ron Cloutier, Massachusetts Forestry Association, New Salem
Joel Dumont, Consulting Forester, South Deerfield
Judy Eiseman, Pelham
Andy Finton, The Nature Conservancy
David Foster, Harvard Forest
Al Futterman, Nashua River Watershed Association
Leo Garneau, Licensed Forester, Lowell
Carol Harley, Rochdale
Walt Hubbard, Hubbard Forest Industries, Inc.
Cinda Jones, WD Cowls, Inc.
Mike Leonard, Consulting Forester, Petersham
Bob Leverett, Friends of Mohawk Trail State Forest
Frank Lowenstein, The Nature Conservancy
Mason Phelps, Wendell
Heidi Ricci, Massachusetts Audubon Society
William Sweet, Peace and Social Concerns of Worcester Friends
Joe Zorzin, Licensed Forester, Peru

B. Comments from 9/24/03 public meeting in Athol:

- How will we deal with management at ER boundaries?
- ER boundaries should be consistent with EcoMap
- Include educational component – e.g., management demonstration areas; general public education re: forest management.
- Connectivity of habitats and buffers – how do roads break up habitat blocks?
- Can CRs be put on state lands to assure continuity with changing administrations?

RESPONSE: Our original intent was to keep our ecoregion boundaries consistent with those used in the BioMap project (i.e., the EPA Ecoregions). However, it became apparent that while the EPA boundaries made sense in the western part of the state, there were some serious shortcomings in the east. Conversely, the ecoregion boundaries established by the US Forest Service made good ecological sense in the eastern part of the state, but did not distinguish between some very real differences in landscape features in the west. Since this whole ecoregion planning process is based on those landscape-level features and characteristics, we felt it was necessary to use a hybrid

classification system that provided the “best fit” with our current knowledge about the Massachusetts landscape. Since we have an inter-agency team of resource management professionals working on these ecoregion planning documents, coordinating the management of lands that span ecoregion boundaries should not be an issue.

We hope to make public and landowner education an important component of future management efforts. There are many statements in the document that demonstrate this. Habitat connectivity has also been addressed in the document. Regarding putting CRs on state lands, all lands under the Department of Conservation and Recreation and the Division of Fisheries and Wildlife are permanently protected for conservation purposes by Article 97 of the Massachusetts State Constitution. The only way that this dedication to conservation purposes can be removed from any parcel of land is through a 2/3 majority vote of both branches of the Legislature and signature by the Governor. EOEA has a “no net loss of open space” policy whereby any legislation that includes the loss of state or municipal conservation land include the provision for the protection of open space with equal acreage and natural resource value. This policy can be overridden by legislation, however. As all environmental agency land has this protection, a conservation restriction would not add any protection as the restriction could be canceled by this same legislative process.

C. Written comments and responses (Note: numbers in parentheses refer to individual reviewers):

1) Comments related to the planning ‘process’

- “every licensed forester and licensed harvester should have been notified regarding this proposal” (1)
- “reach out to get more input from more stakeholders” (2)
- “broaden your outreach” (2)
- “encourage as full distribution and public participation in future drafts as possible” (3)
- “the state has shown over the past several years no interest in public input and involvement” (5)
- “Development of broad-scale perspectives...is critical...It is essential that EOEA take a lead in this effort.” (6)
- “need to improve dissemination of information regarding this process” (6)
- “proposing broad land-use policy changes lacks consensus, adequate public process, and private industry and land owner buy-in” (7)
- “involve major players in the industry as well as their membership associations in all strategic planning efforts” (7)
- “your list of participants so far is made up of non-profit environmental groups and government agencies. That’s not balanced” (7)
- “I am outraged that private practicing consulting foresters were not asked for any input...” (9)
- “It’s important to get it right the first time...In addition, it is very important that the final Document be posted on the net so that all stakeholders may review it...” (10)
- “The public should definitely be informed of and participate in the process” [to achieve larger regional goals] “it would be necessary for the management plans to be coordinated between ecoregions” (12)

RESPONSE: We agree that the public input portion of this process was too limited, and have taken steps to correct this. The original impetus for this ecoregional planning process was a requirement in the Forest Certification audit that we should develop individual state property management plans within the context of a larger “landscape-level” framework. Accordingly, the initial mailing of the draft ecoregion document was to those groups and individuals who had been involved in the Forest Certification process, plus those who had attended the 9/24/03 public meeting on the Lower Worcester Plateau Ecoregion planning process. While this did include major interest groups such as Massachusetts Association of Professional Foresters

and Massachusetts Wood Producers Association, it did not include all individual members of groups such as these who live and work in the LWP ER.

However, as word spread about this new planning process, it became apparent that there was widespread interest in such landscape-level planning in its own right – i.e., not just in relation to the Forest Certification process – and we received many more requests for copies of the document. We did our best to accommodate those requests, and also extended the deadline for comments twice to allow those parties adequate time to review the document.

As a result of the feedback we received, we decided to: 1) produce a second review draft incorporating many of the comments received in the first round of public review, and put that second draft out for further public review; 2) post the second draft on the internet; and 3) greatly expand our mailing list. In addition, as we move to other ecoregions in the future, we will strive to provide more complete notification and access to draft documents and public meetings, and more lead time for reviewers.

Finally, to address issues that cross ecoregion boundaries, we will conduct GIS and other data analyses for ALL ecoregions, plus gather statewide statistics prior to starting the planning process for the next ecoregion(s). Also, planning for possible forest reserve areas will be initially conducted at the statewide (and possibly beyond) level, thus allowing for the identification of potential reserves that span ecoregion or even state boundaries.

2) Content-related comments

- “report lacks certain important aspects of forest ecology” (2)
- “tourism and recreation values of public forests...should be considered...and protected” (2)
- “final report should break down [timber size classes] into subcategories” (2)
- “references to sawtimber size classes beg for greater age differentiation” (8)
- “all forests of ‘sawtimber’ class are lumped into one big category...This seems to fly in the face of sound ecological and habitat concerns...” (13)
- “Living Waters” information should be included (3)
- report doesn’t mention if ACECs are present in ecoregion (3)
- “Discussion of long-term or even the recent dynamics in wildlife and high priority conservation species is largely absent...highlight the remarkable return and increase of native and forest-dwelling species” (6)
- recent information from Harvard Forest examining forest harvest patterns should be cited (6)
- the draft “neglects to draw one obvious conclusion...that at any given time the majority of the [pre-settlement] landscape of the Lower Worcester Plateau would have been in mature or old-growth condition...Although our modern forest is maturing, it is still comprised of many faster growing, intolerant to moderately tolerant, and successional species than 400 years ago.” (6)
- “I really like the extensive use of maps, as well as the numerous data tables. I would suggest that you include some additional maps...” (6)
- “add bark and sawdust to your list of products from sawmills” (7)
- “include [other] important functions of Massachusetts public forests...to avoid the appearance of a timber bias” (8)
- “I would like to see mention of...restoration forestry... [which] could address off-road vehicle impacts and invasive plant encroachment” (11)
- “draft seems to include valuable information...[including] emphasis on sustainability, the concern about forest health, the acknowledgement of forests as key to not only wildlife habitat, clean air and water, but also as providers of spiritual and psychological benefit” (11)

- “For understanding Green Certification, it might be helpful to have a detailed description in an appendix.” (12)
- “Harvard Forest is also a ‘special place’ worthy of mention.” (12)
- “include ‘protection of biological diversity’ as one of the attributes [of forest ecosystems]” (12)
- “include a glossary of unfamiliar terms” (12)

RESPONSE: These ecoregional planning documents are primarily focused on sustainable ‘forest’ management, and are being produced in response to the state’s efforts to have its forest management programs “green certified.” These are not intended to be comprehensive documents addressing all aspects of ecosystem management. However, we have attempted to include various aspects of, and issues related to, forested ecosystems, and have made various changes in the document to accommodate some of the above reviewer comments. For example, we have added other values to the list of products from and functions of Massachusetts forests; we have provided more detail on tree diameter classes; included Living Waters information; included discussion of restoration forestry; added a Glossary; included Harvard Forest as a “special place”; included additional wildlife information; and made reference to Harvard Forest’s recent publication on forest harvest patterns in the region.

3) Forest management approach

- “management should be focused more intensively on private lands than public forests” (2)
- “There seems to be marked preference...for encouraging harvesting of wood products as if that is the only use for forests...that just ain’t so!” (13)
- “active management on public lands should be carefully planned...demonstrate the highest standards and serve as models for private landowners” (2)
- “With regards to cutting practices on state land, there is a lot of room for increased environmental sensitivity, especially with regard to protecting wetlands...buffer zones could be larger...the state can elect to be more protective than the regulations require.” (12)
- “disturbing insinuation...that our forests need to be managed...not supported by science” (2)
- “great forestry does NOT mimic natural disturbances, yet it can work to maintain biodiversity” (5)
- “underlying rationale [related to need for more mid-seral forest] needs to be laid out quite openly...There is a need to clearly articulate rationale and logic before defining goals or launching into prescriptions for management” (6)
- “There also appears to be some optimal and desirable age-structure distribution in mind. What is this and why is it desirable?” (6)
- “We agree that there is a need for a better mix of ages. However, the approach to achieving the mix needs to be spelled out...The draft needs to address how DCR will determine the mix...of forestland to actively manage, place under long term rotation, and to preserve.” (8)
- “Red oak is the most important commercial hardwood tree in our forest...The current level of oak harvesting is not sustainable.” (9)
- “Since red oak is being cut faster than it is growing, then conditions for wildlife are decreasing...” (9)
- “the draft document should ...[identify] sites which would benefit from restoration forestry” (11)
- “The ‘waste’ from harvesting should be left to enrich the soil and snags and large woody debris should be left as habitat.” (12)
- “protection and ‘no management’ seems to be the best policy for the health of the forests” (14)

RESPONSE: All 3 agencies involved in this planning process are charged with managing their lands for various purposes, so while we do not mean to imply that forests “need to be” managed, we do believe that some portion of DCR and DFW lands should be managed to help achieve agency goals and mandates. The ER document assesses conditions and identifies issues in the whole ecoregion; however, we only have direct control over management on state-owned lands. We can only indirectly influence what happens on private lands. We agree that state land management should be carefully planned (hence this Ecoregion planning process) and be held to high standards – that is our goal. Where and when it’s appropriate to do so, state land management can and will exceed minimum regulatory standards.

We agree that the document should better articulate the rationale and basis for advocating a different mix of forest age classes (or seral stages) in the ecoregion – we have developed this section more in the second draft. Further, we have included discussion of “restoration forestry” and coarse woody debris in the second draft.

Regarding harvest levels of red oak, a couple reviewers indicated that the current level of red oak harvest is not sustainable. While this may be true statewide (at least for removals vs. growth of “growing stock”), this does NOT appear to be the case in the LWP Ecoregion, where FIA data suggests that only 46% of growing stock, or 34% of sawtimber volumes, are removed annually, on average. Still, we recognize the tremendous value of the northern red oak resource in this ecoregion, and that’s why we identified it as one of our management issues.

While forest management may not exactly duplicate the conditions brought about by “natural disturbances,” we nonetheless believe that, in some situations, it may be appropriate to manage in a way that generally mimics the result of windstorms, ice damage, and other natural disturbances since these were among the dominant influences on our forests prior to human arrival.

4) Reserves/set asides/old growth

- Some areas “should be left alone as control sites and for their own intrinsic values” (2)
- “final report should set some minimum percentage or acreage goals for reserved public forest areas” (2)
- “no recognition...of old growth or exemplary second growth” (13)
- “report also fails to mention DEM old growth policy” (2)
- “should call for long term protection of forests >110 years old” (2)
- “no mention of any old-growth or exemplary stands nor mention of “no harvest” zones” (3)
- document should “highlight the opportunity to establish a few large (e.g., 25,000+ acre) reserves, free from active human management” (6)
- “If there is one important (pre) historic feature that is missing from the [LWP] landscape it is large, quiet stretches of old forest” (6)
- “The plan also needs to address old growth and exemplary second growth” (8)
- “As much as 60,000 acres could be set aside as “wilderness areas”...in order to protect old growth areas and other areas of ecological significance” (9)
- “the draft document should advocate for an inventory of old growth forest, primary forest, and exemplary second growth forests...identify those forests least disturbed by humans and protect them from tree harvesting and development.” (11)
- “there should be old growth in places and there should be unmanaged lands.” (12)

- “...no recognition is given to old growth or exemplary second growth...At minimum some large forest areas should be set aside for no management to protect them as controls for study comparisons” (13)
- “part of the management plan should be an attempt to designate a connected network of unmanaged core areas surrounded by buffer areas managed for ecological forestry, etc.” (12)
- [Since] “the state [does] not have the ability (read funding) to manage all its lands to the same standard as was being proposed [Note: this comment related to statements made at the Federation of Women’s Clubs State Forest public meeting], the state should manage what it can manage well, and put the rest into reserves.” (12)
- “our main concern should be the protection of “Old Growth and secondary Old Growth forests... We also need to be concerned with the effects of recreation in areas of rare growth...” (14)
- [the paragraph suggesting that ‘forest managers can realize many of the habitat benefits associated with unmanaged forest landscapes’ through management] “is ‘greenwashing’...and should be removed from the document” (11)
- More detail needed on “unmanaged” areas – Where? What types? How much? Concentrating vs. dispersing unmanaged areas; “deliberate” vs. “default” reserves; how to coordinate among agencies.

RESPONSE: We fully agree that this document must devote considerable attention to the issue of reserves, set asides, and old growth. We did not include such a section in the first draft because we were still actively discussing and developing our thoughts and proposals on this issue (including discussions with The Nature Conservancy, which has been doing substantial research on reserve establishment recently), and were simply not ready to write that section back in October.

Please refer to Sections III and VIII in this second draft for more information on forest reserves.

5) Need for more information

- “need for more finely detailed ecological inventories on which to base site-specific management planning” (2)
- “public lands should not be cut until [detailed inventories are conducted] and made available for public review” (2)

RESPONSE: The detailed inventories called for in these comments cannot be conducted for the whole (and for each) ecoregion. However, in many cases, such information will be collected at the more local level as actual management plans for individual state-owned properties are developed. As part of the requirements for FSC Forest Certification, DSPR is completing maps of the forest communities on their land and DFW is completing a field ecological inventory of their land (DFW already has a forest community map and DSPR has a recently-completed continuous forest inventory).

6) Natural disturbances

- “inappropriate...to lump natural disturbances such as wind and ice with...introduced pests and diseases” (2)
- do “not group forest management with storms, insects and disease” Listing it as a “disturbance agent” implies that it is a bad thing. (7)
- “What frequency of fire do you consider to be high, and what does that portend for management prescriptions?” (8)

RESPONSE: Forest management is conducted to meet specific mandates and/or management goals. It is, however, a form of disturbance and was included in this section for that reason. Introduced pests and diseases were placed in this section because, although caused by human actions, they can also result in forest disturbance. Fire might be considered in forest management planning, but its use is often constrained by the forest cover type or the community setting of the forest. For example, pitch pine barrens (such as the Montague Plains) require a detailed planning process to safeguard ecological processes and local residences. Other forests are less prone to catastrophic fire and a more general approach to reducing fire hazard can be taken.

7) Carbon sequestration

- “if current forest is sequestering carbon near their maximum rate, how does cutting...increase sequestration?” (2)
- “Great paragraph on carbon sequestration.” (7)
- “If [state] forests are not being actively managed...it is impossible that they are sequestering carbon at near their maximum rate.” (7)
- “we urge caution in promoting carbon sequestering as a justification for reducing the average age of the forest...the overall process is more complicated than just the young versus old tree scenario” (8)

RESPONSE: We generally agree with these comments, and have made appropriate changes to the document to clarify the apparent inconsistency, and also convey that the state of our knowledge and understanding about carbon sequestration, especially as it relates to forest management, is still incomplete.

8) Policy and goal-related issues and needs

- “appears to be an assumption that there is a need to maximize regional biodiversity. Is this an EOE goal, and if so, why, and which type of species?” (6)
- “A major management goal for [all] ecoregions should be the preservation of natural biodiversity” (12)
- “important issues [e.g., regeneration of red oak; development of local markets] should be addressed through more specific policy, regulatory and educational initiatives” (2)
- Do “not legislate private land use restrictions, or otherwise force the hands of private property owners” (2)
- “let us advocate for the reduction of the use of wood and paper products within the Commonwealth, and encourage increased recycling...” (11)
- “major factors threatening forests, [etc] are sprawl, forest conversion and parcelization...why not concentrate EOE talent and effort towards landowner education and forestry outreach, legislative (Chap.61) reform, and land protection” (6)
- “Public forests – land owned by the citizens of the Commonwealth of Massachusetts – should not be considered exploitable...we do not want deforestation in Massachusetts” (11)
- [call for more] ‘local production of products and energy supplies’ [could be] “an excuse to expedite deforestation” (11)
- “continue striving for sustainable working forests on public land in the state. But...do not limit your definition of “sustainable forestry” to that of one for-profit certifying agent.” (7)

RESPONSES: Biodiversity conservation is certainly an important goal for EOEAs as well as the three land management agencies, however we do not have a specific goal to “maximize” regional biodiversity. Specific attempts at enhancing regional biodiversity will be driven by the possibilities and opportunities that present themselves in the subsequent development of individual land management plans for state-owned properties.

These Ecoregion Guidance Documents will largely be used to guide forest management activities on state-owned lands, although some of the identified issues and management goals could also apply to private lands. However, we have no intention of “legislating” or otherwise imposing restrictions on private land use as part of this process. Further, it is unlikely that we would propose regulatory changes to deal with issues such as enhancing red oak regeneration or developing local markets, although it is possible that new EOEAs policies or incentives that address these issues could be developed. Educational efforts will likely receive the most attention. Educational and incentive programs are already in place for recycling. Advocating for a reduction in the use of wood products is more controversial however, since many people believe that it is more environmentally friendly to use renewable wood products rather than other materials that have hidden environmental costs related to their production and/or disposal.

Landowner education and forestry outreach, legislative (Chapter 61) reform, and land protection are all very important components of forest ecosystem conservation, and we hope to see continued progress in all of those areas. However, the main focus of this planning effort is to coordinate and improve the sustainable management of state-owned forestland. At least on those lands, “exploitation” and “deforestation” are the antithesis of our general goal of sustainable, sensitive management. However, on some private lands, these concerns may be real. Education, Chapter 61 reform and zoning reform should help in this regard, but ultimately, private landowner rights will likely limit the effectiveness of state efforts to minimize practices that might be considered exploitive and unsustainable. EOEAs will be convening a conference in the spring of 2004 with representatives of the major forest interests to draft an action plan on these issues.

Our definition of “sustainable forestry” (see Glossary) does not come from the organization that is certifying our forest management program. Further, the “standards” against which our program is evaluated were not developed by the certifying agent, but by the Forest Stewardship Council – an international organization founded and backed by a wide range of environmental, industry, professional and community groups.

9) Socio-economic factors

- “simply listing mills within the region [also foresters and loggers] does not reflect the scope of activity that actually occurs there” (4)
- the number of licensed foresters in the ER is misleading because “many are simply NOT private consulting foresters” (5)
- the focus on numbers of forest product businesses and professionals gives “a distorted view of the world and the potential uses and current economies of Massachusetts forests”. Broaden coverage to include conservation organizations, land trusts, tourism, etc. (6)
- disagrees with statement about making Massachusetts more self-sufficient in use of wood products – “exporting logs to the best markets...makes forest management a smarter economic endeavor, which will encourage more management” (5)

RESPONSE: We used the best information we could find to list the mills, loggers, foresters, etc. operating in the ecoregion. Still, we acknowledge that such a list does not give a complete picture of the amount of forest product related “business” that occurs in the ecoregion. We have modified the text in the second draft to reflect this. Regarding the issue of exporting logs, there are several reasons why making Massachusetts more self-sufficient in the use of wood products makes

environmental and economic sense. It is one of the purposes of state government to improve the livelihood of its residents. We are attempting to meet this purpose by encouraging the “value-added” economic aspects of wood products in Massachusetts. From an environmental perspective, reducing transportation of raw materials and finished products is a good thing.

10) Public-private partnerships

- “prefer to have public-private partnerships like the Peck/Hull project than a federal forest” (4)
- the state should consider the “agenda” of potential partners to assure that that any partnerships “benefit the forest and its inhabitants” (11)

RESPONSE: We agree that more public-private partnerships (like the Peck/Hull project) are desirable, and that the “agenda” of potential partners must be considered when establishing such partnerships. The “national forest” issue does not involve the LWP ecoregion, but will likely be addressed when we deal with the northern Berkshires ecoregions.

11) Accuracy comments

- “not sure that [new CRs on lands in Brimfield and Sturbridge] were accurately mapped” (4)
- disagrees that ‘issue of forest sustainability has only recently been given the degree of attention that it deserves’; “some have been pushing hard for several years to see more sustainable forestry” (5)
- “I question [the landuse figures in Table3]” (7)

RESPONSE: Note: In addition to the above comments, a couple reviewers provided detailed editorial-type comments on the draft document, many of which identified minor mistakes in figures, etc. We greatly appreciate these efforts to make the document more accurate, and have double-checked many statements, tables and figures, and made a number of changes as a result. We also acknowledge the efforts of people in the forestry community who have been pushing for sustainable management, and have made appropriate changes in the text to reflect this.

12) High-grading

- “One of the most important issues is high-grading...Ignoring this issue [High-grading] any longer will result in forests being further degraded” (5)
- “strongly disagree with [the document’s] rationalization for high-grading” [i.e., market conditions and inadequate recognition of economic value of long-term stewardship] because it “softpedals the problem”. “High grading occurs because some people CHOOSE to high grade” (5)
- “Up to 80% of all [Bureau of Forestry]-approved Forest Cutting Plans are exploitative high-grade cuts” (9)

RESPONSE: We agree that high-grading (on some private forestlands) is a serious issue in the state, and we acknowledged this (and identified it as a major issue in the ecoregion) in our first draft. Current efforts in DCR are geared towards making changes in Chapter 132 (The Forest Cutting Practices Act) policy that will start to address this issue. However, we stand by our belief that market conditions and inadequate recognition of the benefits of sustainable management are contributing to this problem. Granted, landowners sometimes “choose” to high-grade, but we believe that they often do so because they believe they can make more money (i.e., over the short-term) or because the benefits of long-term stewardship of their land (versus short-term exploitation) have not been adequately explained to them. This points to the need for better education of forest landowners, and perhaps greater accountability for the foresters who are working with those landowners.

13) Economic issues

- “no mention of greatly improving on the economic considerations...no reason...why management of state forests can’t incorporate a business like attitude...state must prove...that they can protect...forest resources...while being profitable” (5)
- “landowners are not being paid full value for their timber” (9)
- “high-grading is financially very shortsighted” (9)
- “I would like to see financials related to the state-owned forest lands audit by Scientific Certification Systems, and also and Forest Stewardship Council-related financials” (11)

RESPONSE: DCR is giving serious consideration to establishing a pilot project to implement the forest management called for in a completed State Forest Plan using one or more licensed professional forester from the private sector. The education of landowners will improve with the new Forest Cutting Plan form being used beginning in January of 2004 as well as the “Call Before You Cut” 800 number and other educational tools such as the several thousand copies of the Woodlot Owners Guide recently distributed to private landowners. Based on the comments made to this plan, DCR and DFW plan to add information to their web sites explaining about high grading, including the long-term financial losses this practice incurs. The FSC Forest Certification process involved competitive proposals for the work outlined by EOEA. The Scientific Certification Systems firm was selected based on this process. The \$135,000 cost for this project includes a detailed review of all the paper documentation from the three land-holding Divisions, site inspections on over 70 sites across the state, drafting of detailed conditions and recommendations on over 100 FSC criteria, and annual audits of the progress of the three Divisions for the next five years. This investment has given EOEA and its three land managing Divisions a clear blueprint to make our forest management “world class” over the next five years and will track our progress toward this goal during this period. For the guidance it gives the agencies charged with managing 10% of the land of the state and the information it will provide to a very interested public, we feel it was a good investment. Having Forest Certification will also help the state to market its products in new ways that will help stabilize the sale of its wood products and that may provide a premium for these sales over the long term. The experience of Quabbin Reservoir’s Certification substantiates the case that market stabilization can occur from Certification.

14) Bureaucratic or operational changes and needs

- state should “require that only a Licensed Forester prepare cutting plans” and “only Licensed Foresters can be on the Forester License Board” (5)
- “current forestry establishment...hinders the needed reform because it would lose its privileges” (5)
- needed changes in FCPA are being nixed (5)
- existing harvesting laws aren’t being enforced (5)
- “Forester Licensing Board totally ignores...violations [related to high-grading]” (9)
- “Chapter 61...is a stop gap measure...landowners get in and out all the time...current enrollment...may in fact be declining” (9)
- “Chapter 61...must be improved by repealing the 8% stumpage tax and all filing fees...there should be no penalty when a landowner changes from Ch.61 to Ch.61A or Ch.61B...eliminate right of first refusal” (9)
- “Require that only MA Licensed Foresters be able to prepare and file any and all Forest Cutting Plans.” (9)
- “some money received in conjunction with forest harvests could be used to protect more land, to compensate private land owners for their cooperation with the LWP goals, and make payments in lieu of taxes...” (12)

RESPONSE: DCR has completed an extensive public process to revise its Chapter 132 Cutting Plan policies which will begin implementation in January. These changes will clearly document the amount of high grading occurring while at the same time educate landowners and discourage them from this practice. After a trial period, DCR will have the information to assess the success of this approach and fine-tune it. DCR recently appointed a new Chief Forester who is reviewing the make-up of the Forester Licensing Board and how the reducing high grading can be incorporated into their charge. EOEA will be working with diverse interests to hold a forest forum in the spring of 2004 to formulate an action plan of “common ground” among divergent forest interests. The issue of revamping Chapter 61 or even supplementing the act with a new law that will result in a higher percentage of participation will be one of the goals of this conference.

15) Private land stewardship

- “you’re inaccurate and wrongly generalizing about [private] land management and forest health...major landowners in the state are members of the forest products industry, and ...are managing sustainably.” (7)
- “only 15% of private forest is well managed, almost all the rest...is high-graded sooner or later” (5)
- “focus should be providing guidance, technical assistance, and incentives for landowners, not broader regulations”. State employees should not “be developing plans for the ‘regulation of activities on private forestlands’”. (7)
- “provide incentives, guidelines and assistance to encourage private landowners to undertake sustainable forestry techniques and contribute to the strength of the forest products industry” (7)
- “great to encourage Chapter 61 management planning.” (7)
- “hope that more can be done, whether in terms of education efforts, direct or indirect financial remuneration, or creative new approaches, to compensate landowners for maintaining undeveloped forest land.” (11)
- [We should] “raise the bar” on expectations for forest health. (11)
- Opposed to encouraging landowners to become “green certified” (9)

RESPONSE: We acknowledge that there may be an important difference in the way that “large” private landholders manage their lands, and the type of management that is practiced on some smaller private lands on which high-grading occurs. We changed the text in this draft to reflect this. Other than possible reforms to existing regulations like Chapter 132 (that provide some degree of regulation of forest cutting, including on private lands), we are not proposing any new “regulation of activities on private forestlands” in this ecoregion planning process. However we will pursue efforts aimed at landowner education, incentives, guidance and technical assistance. We agree that we should “raise the bar” regarding sustainable forest management; this might best be accomplished through a partnership of public and private entities, all of whom are committed to bring about this bar-raising.

We believe that the “Forest Certification” process results in many benefits, both to the landowner and to the citizens of the Commonwealth in general, and thus we have encouraged private forest landowners to consider having their lands certified. However, we recognize that not all landowners will have the interest or financial resources to go through that process. We still encourage those who are interested to pursue certification.

EOEA and DCR are currently conducting an outreach and education effort to thousands of private forest landowners in heavily forested communities across the state. This effort involves direct mailing of information on the Forest Stewardship Program and the benefits of professional forest management. All these landowners are offered the opportunity to have a Forest Stewardship Plan funded and completed by a licensed private forester. To date, the owners of 18,000 acres are having Stewardship Plans completed. These plans will also make

them eligible for the Chapter 61 Program and in the past, 80% of Stewardship members entered Chapter 61.

16) Land Conservation

- “locking up land isn’t the only way to conserve biodiversity” (5)
- “pursue a private/non-profit conservation model that achieves your goals without taxpayer expense and government bureaucracy” (7)
- “include landowners and membership organizations for the forest products industry when you develop and implement the SLCP” (7)
- “Table 4 is misleading – town land is not protected under Article 97 unless...and classified land is at best only temporarily protected...you could separate the protection into two categories...” (12)

RESPONSE: Most conservation professionals and organizations agree that the long-term conservation of biodiversity requires a combination of careful, sustainable management practices and land protection programs (including the establishment of “reserve” areas). Regarding the latter, local and statewide land trusts and conservation organizations have made a tremendous contribution to land protection efforts in Massachusetts. However, virtually all of those groups would agree that active involvement by state agencies is also crucial to the success of those efforts. Ultimately, an effective statewide land conservation program will require even more public-private partnerships. We would welcome the active participation of the membership organizations for the forest products industry in the implementation of statewide land conservation efforts.

Table 4 has been modified to better reflect the distinction between land that is permanently versus temporarily protected.

17) Invasives

- “common sense solutions” needed (5)
- “good forest management can help solve this problem” (5)
- “does not yet appear to be any convincing evidence that invasives represent a major problem for forest ecosystem reproduction, function, diversity or productivity...invasives are given unreasonable emphasis...devote considerably more attention to [decline of hemlock from the adelgid] than invasive plant species” (6)
- document omits the “likely important role of forest fragmentation, sprawl and logging in increasing the spread, abundance and aggressiveness of invasive forest species...calling for increased harvesting and an increase in younger age classes may well exacerbate the invasive problem” (6)
- “I would suggest that you shift the focus [regarding Hemlock Woolly Adelgid impact mitigation] from...attempting to replace habitat values lost...to evaluating the full range of potential managerial responses” (6)
- “it should be pointed out that many invasive species are much more likely to invade recently disturbed sites. Even forest management causes disturbance.” (12)
- “It would help...if common plant names were also included.” (12)

RESPONSE: The effects of invasive species are very large in scope and substantial efforts are being made to try to understand their long-term impacts on ecosystem functions (e.g., <http://invasives.eeb.uconn.edu/ipanel/> or www.invasivespecies.gov/ or www.aphis.usda.gov/ppq/ispm/ or www.invasiveplants.net/ or <http://tncweeds.ucdavis.edu/esadocs.html> among many others). Many of these efforts have included details on the known impacts of invasive plants on pre-existing ecosystem functions although a great deal remains to be learned on the persistence of these impacts and their significance to both the natural and human worlds.

Common sense dictates that the best solution to potential problems associated with introduced and potentially invasive species is early detection and prevention of spread. Where these species have become established, the cost of eradication is generally prohibitive and the ecological effects of biological controls are often uncertain. Prevention of further spread requires an understanding of the vectors responsible for this spread. Initial establishment can occur both intentionally as plantings and through unintentional transport by humans, animals, or wind.

For many of the invasive plant species, disturbance of established native plant communities often provides the light and exposed mineral soil required for spreading upland invasive plant species. These disturbances include development (building homes, roads, commercial structures), some forms of motorized recreation (heavy ATV use of an area), and active forest management, which adds light and often scarifies organic layers, exposing mineral soil. For forest management in particular, preventing the spread of invasives requires advance knowledge of their presence in the proposed harvest area and either delaying harvests until invasives are removed or regular follow-ups to remove new plants as they appear in the disturbed area.

Active forestry can also help solve invasive problems. Having trained foresters on the ground can provide early detection of invasives. Prescribed fire has been used to reverse expansions of invasives (e.g., Japanese honeysuckle and Tree-of-heaven; <http://tncweeds.ucdavis.edu/products/handbook/05.PrescribedFire.pdf>), although fire can also encourage some invasives. Deliberate cutting or removal of invasives can be prescribed as part of a harvest or timber stand improvement activity. Foresters are also familiar with the application of herbicides and can prescribe their use by a licensed applicator for invasive control if necessary.

We have made additions to the document to address the concerns outlined here. These include greater detail on the impacts of the exotic hemlock woolly adelgid (HWA), and a section outlining the range of management options in response to HWA currently being considered by various organizations. The list of species officially documented by the IPANE project has been updated to include common names and additional information was added in Appendix IV, including the list of 39 invasive plant species that have been evaluated by the Massachusetts Invasive Plants Working Group.

18) FIA data

- FIA data is “inadequate” – “it rationalizes too little harvesting on state land, it rationalizes cutting immature trees...” (5)
- Using decimal places in removal figures “implies that it’s a rather accurate number...there is no scientifically good numbers on timber harvest” in part because “the numbers on Mass. cutting plans are off by at least 100%” (5)

RESPONSE: We recognize that FIA data has some limitations, but it still represents the best data that we currently have on forest conditions across the whole state. This information, collected by the U.S. Forest Service at approximately 14-year intervals, is derived from a combination of aerial photo interpretation and actual measurements of conditions on a number of ground plots. For the 1998 Massachusetts survey, more than 18,000 photo points, and almost 800 ground plots were measured. Still, the results are only “estimates” of true conditions, and thus should be used with appropriate caution. In general, we believe that data provides a fairly accurate picture of forest conditions statewide, and a general picture of conditions in the larger ecoregions (such as the LWP). We are in communication with the USFS to determine if we should attempt to use the data for the smaller ecoregions. We presented the average annual removal data with one decimal place because that’s the way it

was presented in the FIA tables. Also, since it represents an "average" of 14 estimates, it's appropriate to use a decimal place.

19) Management of specific state properties

- "only about 3% of the annual volume growth [on state forestlands] is being harvested annually...A further outrage is that very few of our state forests have any Forest Management Plan at all." (9)
- "Forest Management Plans for all 285,000 acres of state forestland must be written before any further timber sales are done" (9)
- "...the work of implementing those plans should be privatized and subcontracted to private consulting foresters." (9)
- Quabbin managers should "just admit" that there's a preference for "forest resource production" instead of allowing an old-growth landscape to develop. "There is no scientific evidence to support the notion that" a "young multi-aged diverse forest is more likely to protect against negative consequences of disturbance or stress" than a "maturing or old growth forest". (6)

RESPONSE: As part of the Forest Certification process, these ecoregional guidance documents will be produced for all ecoregions in the state, followed by individual land management plans for the DSPR, DWSP and DFW properties in those ecoregions. Forest management activities will focus on forests where plans have been completed. However, high priority work will occur on State Forests where plans have not been completed over the next five years. It is the intent of EOEA to assist DCR and DFW to finish plans for all their holdings over the next five years. As noted above, DCR is examining the possibility of contracting the implementation of management called for in completed plans to private licensed foresters on a pilot basis. Regarding the role of forest management in the context of protecting the Quabbin Reservoir, the forest management plans for Quabbin and Wachusett Reservoirs should be consulted for further information.

20) "Forest Certification"

- "SCS is just one of the certifying groups...it is the most expensive...allow other certification programs equal status and opportunity. SCS certified sustainable forestry is not financially or time feasible to mom-and-pop operations." Consider the Tree Farm System as an alternative. (7)
- "The expense and chain of custody requirement of SCS and SFI would limit not improve forest management in the state." (7)
- "Green Certification is a waste of time and money...certifier's exorbitant fees preclude the small business person from getting certified...There is no economic benefit to Green Certification" (9)
- "The state spent over \$100,000 trying to get our state forests certified only to have the application rejected." (9)

RESPONSE: SCS was selected to perform the certification audit of Massachusetts forestland through a competitive process. We believe this process has been beneficial in many ways. For example, it has resulted in a much more comprehensive planning process for state-owned lands; it has jump-started the process of identifying and protecting "reserve" areas; and it has resulted in closer communication, coordination and joint planning among the 3 main land management agencies in the state. And contrary to one reviewer comment, we firmly believe that it WILL improve forest management in the state. We think it was taxpayer money well-spent. And for the record, the state's application for certification was not rejected. We are presently in the process of complying with the "pre-conditions" identified by the certifying agent, and we expect to have a formal announcement of the state's official certification early in 2004. Finally, we recognize that many "mom-and-pop" operations cannot afford the money or time needed to have their operations certified. In those cases, we would still encourage those

landowners to learn about and practice sustainable forest management, and would encourage them to join the Tree Farm program. FSC Certification has been received by larger private landowners across the U.S. and even by groups of smaller landowners such as the recent FSC Certification of the Massachusetts Woodlands Cooperative.

21) Forest fragmentation

- “you conclude that forest fragmentation is not a major issue at the present time. But you spend many paragraphs spelling out the details of this effect...reduce the paragraphs to one sentence to precede your above conclusion” (7)
- “I take issue with this statement [that forest fragmentation is not a major issue in the LWP ecoregion at the present time]...I have witnessed fragmentation which...is significant...who decides whether something is a “major issue?”” (11)
- “public ownership has not traditionally achieved your stated goal...don’t propose that state and federally owned land is the solution to fragmentation” (7)

RESPONSE: The data on landuse changes and existing “contiguous natural lands” in the LWP ecoregion suggest that forest fragmentation is not a major issue at the present time. However, we believe that there is a very real potential for it to become one in the near future. Further, examples of local fragmentation can certainly be found in the ecoregion, as the 2nd comment above indicates. This is why we devote a fair amount of attention to this issue in this document. And while we are not proposing “public ownership” as the solution to fragmentation, the protection of large blocks of forestland through purchase does have its place in efforts to deal with this issue. Still, we believe that ultimately, we must combat fragmentation through a combination of public and private efforts (and partnerships), involving statewide and local zoning changes, acquisition of development rights (while leaving the land itself in private ownership), and some outright purchases. Further, we believe that by providing better education and incentives for sustainable forest management, we can help slow the conversion of forestland to development and other non-forest uses.

22) Water resources

- “What precisely is an ORW area? And what is its significance?...watersheds are not ORWs” (12)
- “We also need to be concerned with the effects of ...runoff and pollution by some of these businesses” (14)

RESPONSE: ORW (“Outstanding Resource Water”) is a term used in the Massachusetts Surface Water Quality Standards (314 CMR 4.04) to designate waters with exceptional socio-economic, recreational, ecological and/or aesthetic values. Typically, public drinking water reservoirs, their tributaries, and associated bordering vegetated wetlands are included in this designation. However, since state regulations include an “antidegradation” provision that prohibit water quality degradation in ORWs, activities that occur in the watershed areas that contribute to the actual ORWs may also be subject to increased environmental regulation. Accordingly, the MassGIS datalayer for ORWs includes the whole drainage area, and we have also chosen to include them in these documents. However, we have changed the wording in the document to clarify the distinction between ORWs and their drainage areas.

We agree that runoff and pollution are important concerns in any ecoregion or watershed area. These concerns will certainly be taken into consideration in management operations on state forestland.

Appendix III. Listed species and natural communities known to occur in the Lower Worcester Plateau ecoregion.

A. Listed Species:

Taxonomic Group	Scientific name	Common Name	Grank	Srank	DFW Rank	Federal Rank
Fish	<i>Notropis bifrenatus</i>	Bridle Shiner	G5	S?	SC	
Amphibian	<i>Ambystoma jeffersonianum</i>	Jefferson Salamander	G5	S3	SC	
Amphibian	<i>Ambystoma laterale</i>	Blue-Spotted Salamander	G5	S3	SC	
Amphibian	<i>Ambystoma opacum</i>	Marbled Salamander	G5	S2	T	
Amphibian	<i>Gyrinophilus porphyriticus</i>	Spring Salamander	G5	S3	SC	
Amphibian	<i>Hemidactylium scutatum</i>	Four-Toed Salamander	G5	S3	SC	
Reptile	<i>Carphophis amoenus</i>	Eastern Worm Snake	G5	S3	T	
Reptile	<i>Clemmys guttata</i>	Spotted Turtle	G5	S3	SC	
Reptile	<i>Clemmys insculpta</i>	Wood Turtle	G4	S3	SC	
Reptile	<i>Elaphe obsoleta</i>	Rat Snake	G5	S1	E	
Reptile	<i>Emydoidea blandingii</i>	Blanding's Turtle	G4	S2	T	
Reptile	<i>Terrapene carolina</i>	Eastern Box Turtle	G5	S3	SC	
Bird	<i>Ammodramus savannarum</i>	Grasshopper Sparrow	G5	S2	T	(PS)
Bird	<i>Botaurus lentiginosus</i>	American Bittern	G4	S2	E	
Bird	<i>Circus cyaneus</i>	Northern Harrier	G5	S1	T	
Bird	<i>Cistothorus platensis</i>	Sedge Wren	G5	S1	E	
Bird	<i>Gavia immer</i>	Common Loon	G5	S1	SC	
Bird	<i>Haliaeetus leucocephalus</i>	Bald Eagle	G4	S1	E	(PS:LT,PDL)
Bird	<i>Ixobrychus exilis</i>	Least Bittern	G5	S1	E	
Bird	<i>Podilymbus podiceps</i>	Pied-Billed Grebe	G5	S1	E	
Bird	<i>Pooecetes gramineus</i>	Vesper Sparrow	G5	S2	T	
Bird	<i>Rallus elegans</i>	King Rail	G4G5	S1	T	
Bird	<i>Vermivora chrysoptera</i>	Golden-Winged Warbler	G4	S1	E	
Mammal	<i>Sorex palustris</i>	Water Shrew	G5	S3	SC	
Mammal	<i>Synaptomys cooperi</i>	Southern Bog Lemming	G5	S2	SC	
Mussel	<i>Alasmidonta undulata</i>	Triangle Floater	G4	S3	SC	
Mussel	<i>Alasmidonta varicosa</i>	Brook Floater (Swollen Wedgemussel)	G3	S1	E	
Mussel	<i>Strophitus undulatus</i>	Creeper	G5	S3	SC	
Crustacean	<i>Crangonyx aberrans</i>	Mystic Valley Amphipod	G3	S2S3	SC	
Crustacean	<i>Eubrachipus intricatus</i>	Intricate Fairy Shrimp	G5	S1	SC	
Odonate	<i>Aeshna mutata</i>	Spatterdock Darner	G3G4	S1	E	
Odonate	<i>Anax longipes</i>	Comet Darner	G5	S2	SC	
Odonate	<i>Enallagma laterale</i>	New England Bluet	G3	S2S3	SC	
Odonate	<i>Gomphus borealis</i>	Beaverpond Clubtail	G4	S2	SC	
Odonate	<i>Ophiogomphus aspersus</i>	Brook Snaketail	G3G4	S2	SC	
Odonate	<i>Somatochlora elongata</i>	Ski-Tailed Emerald	G5	S2	SC	
Odonate	<i>Somatochlora forcipata</i>		G5	S?	SC	
Odonate	<i>Somatochlora incurvata</i>		G4	S?	T	
Odonate	<i>Stylurus spiniceps</i>	A Clubtail Dragonfly	G5	S1	T	
Odonate	<i>Williamsonia fletcheri</i>	Ebony Boghaunter	G3G4	S1	E	
Odonate	<i>Williamsonia lintneri</i>	Ringed Boghaunter (Banded Bog Skimmer)	G3	S1S2	E	
Beetle	<i>Cicindela purpurea</i>	Purple Tiger Beetle	G5	S2S3	SC	
Lepidopteran	<i>Callophrys hesseli</i>	Hessel's Hairstreak	G3G4	S2S3	SC	
Lepidopteran	<i>Hemaris gracilis</i>	Slender Clearwing Sphinx Moth	G3G4	S2S3	SC	
Lepidopteran	<i>Papaipema appassionatea</i>	Pitcher Plant Borer Moth	G4	S1S2	T	
Lepidopteran	<i>Rhodoecia aurantiago</i>	Orange Sallow Moth	G4	S2S3	T	
Vascular Plant	<i>Adlumia fungosa</i>	Climbing Fumitory	G4	S2	T	

Vascular Plant	<i>Amelanchier bartramiana</i>	Bartram's Shadbush	G5	S2	T	
Vascular Plant	<i>Arabis laevigata</i>	Smooth Rock-Cress	G5	S2	T	
Vascular Plant	<i>Arceuthobium pusillum</i>	Dwarf Mistletoe	G5	S3	SC	
Vascular Plant	<i>Arethusa bulbosa</i>	Arethusa	G4	S2	T	
Vascular Plant	<i>Asplenium ruta-muraria</i>	Wall-Rue Spleenwort	G5	S2	T	
Vascular Plant	<i>Carex grayi</i>	Gray's Sedge	G4	S2	T	
Vascular Plant	<i>Carex polymorpha</i>	Variable Sedge	G3	S1	E	
Vascular Plant	<i>Clematis occidentalis</i>	Purple Clematis	G5	S2	SC	
Vascular Plant	<i>Corallorhiza odontorhiza</i>	Autumn Coralroot	G5	S3	SC	
Vascular Plant	<i>Elymus villosus</i>	Hairy Wild Rye	G5	S1	E	
Vascular Plant	<i>Eriophorum gracile</i>	Slender Cottongrass	G5	S2	T	
Vascular Plant	<i>Isotria medeoloides</i>	Small Whorled Pogonia	G2	S1	E	LT
Vascular Plant	<i>Juncus filiformis</i>	Thread Rush	G5	S1	E	
Vascular Plant	<i>Liatris borealis</i>	New England Blazing Star	G5?T3	S3	SC	
Vascular Plant	<i>Lipocarpa micrantha</i>		G4	S2	T	
Vascular Plant	<i>Lygodium palmatum</i>	Climbing Fern	G4	S3	SC	
Vascular Plant	<i>Malaxis bayardii</i>	Bayard's Green Adder's-Mouth	G2	S1	E	
Vascular Plant	<i>Metarrhithis pilosaria</i>	Coastal Swamp Metarrhithis Moth	G3G4	S2S3	SC	
Vascular Plant	<i>Mimulus moschatus</i>	Muskflower	G4G5	S1	E	
Vascular Plant	<i>Orontium aquaticum</i>	Golden Club	G5	S1	E	
Vascular Plant	<i>Panax quinquefolius</i>	Ginseng	G3G4	S3	SC	
Vascular Plant	<i>Poa languida</i>	Drooping Speargrass	G3G4Q	S1	E	
Vascular Plant	<i>Podostemum ceratophyllum</i>	Threadfoot	G5	S2	SC	
Vascular Plant	<i>Potamogeton vaseyi</i>	A Pondweed	G4	S1	E	
Vascular Plant	<i>Prenanthes serpentaria</i>	Lion's Foot	G5	S1	E	
Vascular Plant	<i>Ranunculus pensylvanicus</i>	Bristly Buttercup	G5	S2	T	
Vascular Plant	<i>Rhododendron maximum</i>	Great Laurel	G5	S1S2	T	
Vascular Plant	<i>Scheuchzeria palustris</i>	Pod-Grass	G5	S1	E	
Vascular Plant	<i>Scirpus longii</i>	Long's Bulrush	G2	S2	T	
Vascular Plant	<i>Trichomanes intricatum</i>	A Filmy-Fern	G3G4	S1	E	

B. Natural Communities

Natural Community	Srank
Acidic Graminoid Fen	S3
Acidic Rock Cliff Community	S4
Acidic Rocky Summit/Rock Outcrop Community	S4
Acidic Shrub Fen	S3
Acidic Talus Forest/Woodland	S4
Black Gum Swamp	S2
Calcareous Rock Cliff Community	S3
Calcareous Talus Forest/Woodland	S3
Circumneutral Rocky Summit/Rock Outcrop Community	S2S3
Circumneutral Talus Forest/Woodland	S3
Deep Emergent Marsh	S4
Hemlock-Hardwood Swamp	S4
Hickory - Hop Hornbeam Forest/Woodland	S2
Highbush Blueberry Thicket	S4
High-Energy Riverbank	S3
Inland Atlantic White Cedar Swamp	S2
Kettlehole Level Bog	S2
Level Bog	S3
Major-River Floodplain Forest	S2

Northern Hardwoods - Hemlock - White Pine Forest	S5
Oak - Hemlock - White Pine Forest	S5
Oak - Hickory Forest	S4
Red Maple Swamp	S5
Ridgetop Chestnut Oak Forest / Woodland	S4
Ridgetop Pitch Pine - Scrub Oak Community	S2
Shallow Emergent Marsh	S4
Shrub Swamp	S5
Spruce-Fir Boreal Swamp	S3
Spruce-Tamarack Bog	S2
White Pine - Oak Forest	S5

Codes:

Grank:	
G2	Imperiled —Imperiled globally because of rarity or because of some factor(s) making it very vulnerable to extinction or elimination. Typically 6 to 20 occurrences or few remaining individuals (1,000 to 3,000) or acres (2,000 to 10,000) or linear miles (10 to 50).
G3	Vulnerable —Vulnerable globally either because very rare and local throughout its range, found only in a restricted range (even if abundant at some locations), or because of other factors making it vulnerable to extinction or elimination. Typically 21 to 100 occurrences or between 3,000 and 10,000 individuals.
G4	Apparently Secure —Uncommon but not rare (although it may be rare in parts of its range, particularly on the periphery), and usually widespread. Apparently not vulnerable in most of its range, but possibly cause for long-term concern. Typically more than 100 occurrences and more than 10,000 individuals.
G5	Secure —Common, widespread, and abundant (although it may be rare in parts of its range, particularly on the periphery). Not vulnerable in most of its range. Typically with considerably more than 100 occurrences and more than 10,000 individuals.
Q	Questionable taxonomy that may reduce conservation priority —Distinctiveness of this entity as a taxon at the current level is questionable; resolution of this uncertainty may result in change from a species to a subspecies or hybrid, or inclusion of this taxon in another taxon, with the resulting taxon having a lower-priority (numerically higher) conservation status rank.
T#	Infraspecific Taxon (trinomial)—The status of infraspecific taxa (subspecies or varieties) are indicated by a "T-rank" following the species' global rank. Rules for assigning T-ranks follow the same principles outlined above. For example, the global rank of a critically imperiled subspecies of an otherwise widespread and common species would be G5T1. A T subrank cannot imply the subspecies or variety is more abundant than the species, for example, a G1T2 subrank should not occur. A vertebrate animal population (e.g., listed under the U.S. Endangered Species Act or assigned candidate status) may be tracked as an infraspecific taxon and given a T rank; in such cases a Q is used after the T-rank to denote the taxon's informal taxonomic status.
Srank:	
S1	Typically 5 or fewer occurrences, very few remaining individuals, acres, or miles of stream or especially vulnerable to extirpation in Massachusetts for other reasons.
S2	Typically 6 - 20 occurrences, few remaining individuals, acres, or miles of stream or very vulnerable to extirpation in Massachusetts for other reasons.
S3	Typically 21 - 100 occurrences, limited acreage, or miles of stream in Massachusetts.
S4	Apparently secure in Massachusetts.
S5	Demonstrably secure in Massachusetts
DFW Rank:	
E	Endangered
SC	Special Concern
T	Threatened
Federal	

Rank:	
PS	Indicates "partial status" - status in only a portion of the species' range. Typically indicated in a "full" species record where an infraspecific taxon or population has U.S. ESA status, but the entire species does not.
LT	Listed threatened
PDL	Proposed for delisting

Appendix IV. Partial list of conservation and other organizations for the LWP ecoregion.

Organization	Work Area
Agricultural Land Trust	East Coast
American Farmland Trust	National
Amherst	Town
Appalachian Mountain Club	Northeast
Appalachian Trail Conference	East Coast
Ashby	Town
Ashby Land Trust	Ashby
Athol	Town
Athol DPW	Athol
Auburn	Town
Auburn Water District	Auburn
Barre	Town
Barre Conservation Commission	Barre
Bay State Forestry	Statewide
Bay State Horseback Trail Riders	Statewide
Beaman Memorial Library	West Boylston
Beaver Brook Association	Belchertown
Belchertown	Town
Belchertown Land Trust	Belchertown
Blackstone River Watershed Association	Blackstone River Watershed
Boy Scouts of America	National
Brimfield	Town
Brookfield	Town
Bureau of Land Management	National
Central Massachusetts Planning Commission	Central Mass
Charlton	Town
Charlton Heritage Preservation Trust	Charlton
City of Worcester	Worcester
Coalition for Green Hill Park	Worcester
Connecticut River Watershed Council	Connecticut River watershed
Conservation Law Foundation	Northeast
Ducks Unlimited, Inc., Great Lakes/Atlantic Regional Office	National
East Brookfield	Town
East Quabbin Land Trust	East Quabbin
Eastern Native Tree Society	Eastern US
Environmental League of Massachusetts (ELM)	Statewide
Environmental Protection Agency	National
Erving	Town
Federal Aviation Administration	National
Fitchburg	Town
Fitchburg DPW - Water Division	Fitchburg
Five Colleges, Inc	Western Mass
Forest & Wood Products Institute	Statewide
Forest Stewards Guild	Statewide
Forest Stewardship Program	Statewide

Forest Watch	Northeast
Franklin Land Trust	Western Mass
Franklin Regional Council of Governments	Franklin County
Gale Free Library	Holden
Goodnow Memorial Library	Princeton
Granby	Town
Greater Worcester Land Trust	Worcester
Hampden	Town
Hampden Land Project	Hampden
Hampden Land Trust	Hampden
Hardwick	Town
Harvard Forest	North Quabbin
Harvard University	Statewide
Heyes Forest Products	North Quabbin
Holden	Town
Holland	Town
House of Representatives	Statewide
Hubbardston	Town
Hull Forest Products, Inc.	Northeast
Humane Society US Wildlife Land Trust	National
International Wildlife Coalition	International
Kestrel Trust	Connecticut Valley
Land Trust Alliance	National
League of Conservation Voters Education Fund	New England
Leicester	Town
Leicester Water Supply District	Leicester
Leominster	Town
Leominster Land Trust	Leominster
Leverett	Town
Ludlow	Town
Massachusetts Horticultural Society	Statewide
Manomet Center for Conservation Sciences	Eastern US
Massachusetts Association of Conservation Commissions	Statewide
Massachusetts Audubon Society	Statewide
Massachusetts Builders Land Trust	Statewide
Massachusetts Congress of Lake & Pond Associations	Statewide
Massachusetts Department of Conservation & Recreation	Statewide
Massachusetts Department of Environmental Management	Statewide
Massachusetts Department of Environmental Protection	Statewide
Massachusetts Department of Food and Agriculture	Statewide
Massachusetts Division of Capital Asset Management	Statewide
Massachusetts Division of Fisheries & Wildlife	Statewide
Massachusetts Environmental Trust	Statewide
Massachusetts Executive Office of Environmental Affairs	Statewide
Massachusetts Forestry Association	Statewide
Massachusetts Land Conservation Trust (TTOR)	Statewide
Massachusetts Land Trust Coalition	Statewide
Massachusetts Sportmen's Council	Statewide
Massachusetts Trapper's Association	Statewide

Massachusetts Water Resource Authority	central and eastern Mass.
Massachusetts Wildlife Foundation	Statewide
Massachusetts Wood Producers Association	Statewide
Massachusetts Woodlands Cooperative	Western Mass
MassPIRG	Statewide
Monson	Town
Montachusett Regional Planning Committee	22 north-central Mass. communities
Montachusett Regional Transit Authority	Central Mass
Montague	Town
Mount Grace Land Conservation Trust	North-central Mass
Nashoba Conservation Trust	Nashoba Valley
Nashua River Watershed Association	Nashoba Valley
National Park Service - Massachusetts	Statewide
National Trust for Historic Preservation	National
National Wildlife Federation	National
NE SAF	Northeast
New Braintree	Town
New England FLOW	New England
New England Forestry Foundation	Northeast
New England Mountain Bike Association	New England
New England Society of American Forester	New England
New England Wild Flower Society	Northeast
New Salem	Town
Norcross Wildlife Foundation, Inc.	Monson
North Brookfield	Town
North County Land Trust	North-central Mass
Oakham	Town
Opacum Land Trust	South-central Mass
Orange	Town
Oxford	Town
Palmer	Town
Palmer Water Department	Palmer
Paxton	Town
Paxton Land Trust	Paxton
Pelham	Town
Petersham	Town
Pioneer Valley Planning Commission	42 western Mass communities
Princeton	Town
Princeton Land Trust	Princeton
Princeton Land Trust	Princeton
Rattlesnake Gutter Trust	Leverett
Regional Environmental Council	New England
Restore: The North Woods	Northeast
Richard Memorial Library	Paxton
Riverways Program	Statewide
Rutland	Town
Rutland Conservation Commission	Rutland
Shutesbury	Town
Sierra Club (Massachusetts Chapter)	Statewide

Snowmobile Association of MA	Statewide
Southbridge	Town
Southern New England Forest Consortium, Inc.	Southern New England
Spencer	Town
Sportsmen's Land Trust Ltd	East Coast
State Senate	Statewide
Sterling	Town
Sterling Conservation Commission	Sterling
Sterling Land Trust	Sterling
Sturbridge	Town
Sunderland	Town
Swallow Rise Land Trust	Wendell
Swift River Valley Trust	Swift River Valley Trust
The Cows Companies	Western Mass
The National Wild Turkey Federation	National
The Nature Conservancy	Statewide
The Ruffed Grouse Society, Northeast Region	Northeast
The Trust for Public Land	New England
The Trustees of Reservations	Statewide
The Wilderness Society	National
Trout Unlimited, Massachusetts Council	Statewide
U.S. Fish & Wildlife Service, NE Office	Northeast
U.S. Geological Survey	National
UMass Department of Natural Resources Conservation	Statewide
Umass Extension - University of MA	Statewide
UMass Foundation	Statewide
United States Army Corp of Engineers, New England Division	New England
US Air Force - Westover Air Reserve Base	National
US Air Force, Air Force for Environmental Excellence	National
USDA-Forest Service	National
USDA-Forest Service-Forest Legacy Program	National
USF&W - Conte Refuge	National
USFS Experiment Station-Amnerst	National
Valley Land Fund	Western Mass
	Holden, Paxton, Princeton, Rutland, Sterling, West Boylston
Wachusett Greenways	
Wales	Town
Ware	Town
Warren	Town
Watchdogs for an Environmentally Safe Town (WEST)	Westminster
Wendell	Town
West Boylston	Town
West Boylston Land Trust	West Boylston, Worcester & state
West Brookfield	Town
Westminster	Town
White Oak Land Conservation Society	Holden
Wilbraham	Town
Winding River Land Conservancy	Westfield

Wood Producer	New England
Wood Products Manufacturing Association	Eastern US
Worcester	Town
Worcester Conservation Commission	Worcester
Worcester County Horticultural Society - Tower Hill	Worcester county
Worcester Fresh Air Fund - Camp Putnam	New Braintree, Oakham

Appendix V. Information on invasive plants.

Table 4 shows the currently documented occurrences of invasive plant species in the counties of the Lower Worcester Plateau ecoregion from the Invasive Plant Atlas of New England (IPANE) project. Data were captured by town and summarized by county. This is a trained volunteer mapping and documentation effort, and *by no means a complete survey*. (<http://invasives.eeb.uconn.edu/ipane/index.html>)

The table below lists the 39 species evaluated by the Massachusetts Invasive Plants Working Group against a carefully developed set of criteria. A description of this process and the final report are available as a .pdf download at www.mnla.com. The following description of the criteria is copied verbatim from that report.

For a species to be included as a Non-native Invasive Species or as a Non-native Potentially Invasive Species in Massachusetts, it must be substantiated by scientific investigation (including herbarium specimens, peer-reviewed papers, published records and other data available for public review) to be:

1. Non-indigenous to Massachusetts.
2. Naturalized in Massachusetts.
3. Have the biologic potential for rapid and widespread dispersion and establishment in minimally managed habitats.
4. Have the biologic potential for dispersing over spatial gaps away from site of introduction.
5. Have the biologic potential for existing in high numbers away from intensively managed artificial habitats.

Further, to be included as a Non-native Invasive Species, a species must be documented to:

6. Be widespread in Massachusetts, or at least common in a region or habitat type(s) in the state.
7. Have many occurrences of numerous individuals in Massachusetts
8. Be able to out-compete other species in the same natural plant community.
9. Have the potential for rapid growth, high seed or propagule production and dissemination, and establishment in natural plant communities.

If a species meets the initial 5 criteria but does not, at this time meet Criteria 6-9 (all), it may be considered to be a Likely Invasive Species in Massachusetts if it meets at least one of Criteria 10-12. In the past, some of these species have been considered invasive in Massachusetts, at least in part because they are known to be invasive in other regions and thus expected to be so here.

10. Have at least one occurrence in Massachusetts that has high numbers of individuals forming dense stands in minimally managed habitats
11. Have the potential, based on its biology and its colonization history in the northeast or elsewhere, to become invasive in Massachusetts.
12. Be acknowledged to be invasive in nearby states but its status in Massachusetts is unknown or unclear. This may result from lack of field experience with the species or from difficulty in species determination or taxonomy.

The following species were voted as INVASIVE in MA:

***Aegopodium podagraria* L. Bishop's goutweed, bishop's weed, goutweed**
***Ailanthus altissima* (P. Miller) Swingle Tree of heaven**
***Alliaria petiolata* (Bieb.) Cavara & Grande Garlic mustard**

Berberis thunbergii DC. **Japanese barberry**
Cabomba caroliniana A.Gray **Carolina fanwort; fanwort**
Celastrus orbiculatus Thunb. **Asian or, Asiatic bittersweet, oriental bittersweet**
Cynanchum louiseae Kartesz & Gandhi **Black swallow-wort, Louise's swallow-wort**
Elaeagnus umbellata Thunb. **Autumn olive**
Frangula alnus P. Mill. **European buckthorn, glossy buckthorn**
Glaucium flavum Crantz **sea or horned poppy, yellow hornpoppy**
Hesperis matronalis L. **Dame's rocket**
Iris pseudacorus L. **Yellow iris**
Lepidium latifolium L. **broad-leaved pepperweed, tall pepperweed**
Lonicera x bella Zabel [morrowii x tatarica] **Bell's honeysuckle**
Lonicera japonica Thunb. **Japanese honeysuckle**
Lonicera morrowii A.Gray **Morrow's honeysuckle**
Lysimachia nummularia L. **Creeping jenny, moneywort**
Lythrum salicaria L. **Purple loosestrife**
Myriophyllum heterophyllum Michx. **Twoleaved water-milfoil, variable water-milfoil**
Myriophyllum spicatum L. **Eurasian or European water-milfoil, spike water-milfoil**
Phragmites australis (Cav.) Trin. ex Steud. **common reed**
Polygonum cuspidatum Sieb. & Zucc. **Japanese knotweed; Japanese Bamboo**
Potamogeton crispus L. **Crisped pondweed, curly pondweed**
Rhamnus cathartica L. **Common buckthorn**
Robinia pseudoacacia **Black locust**
Rosa multiflora Thunb. **Multiflora rose**
Trapa natans L. **Water-chestnut**

The following species were voted as **LIKELY INVASIVE** in MA:

Centaurea biebersteinii DC. **Spotted knapweed**
Cynanchum rossicum (Kleopov) Borhidi **European swallow-wort, pale swallow-wort** Form:
Egeria densa Planchon **Brazilian water weed**
Epilobium hirsutum L. **Codlins and cream, hairy willow herb**
Euphorbia cyparissias L. **Cypress spurge**
Hydrilla verticillata (L.f.) Royle **waterthyme**
Microstegium vimineum (Trin.) A. Camus **Japanese stilt grass, Napalese browntop**
Myosotis scorpioides L. **Forget-me-not**
Najas minor All. **Brittle water-nymph, lesser naiad**
Ranunculus repens L. **Creeping buttercup**
Tussilago farfara L. **Coltsfoot**

Excellent reviews of invasives and control methods include:

Tu, M., Hurd, C., & J.M. Randall, 2001. Weed Control Methods Handbook, The Nature Conservancy, <http://tncweeds.ucdavis.edu>, Version: April 2001.

Invasive Plants of the Eastern United States: Identification and Control. www.invasive.org/eastern/

Within the LWP ER, Harvard Forest has initiated invasive plant research on a variety of scales. For details, see: harvardforest.fas.harvard.edu/research/invasives.html

Appendix VI. Cultural Resource Management Guidelines

Cultural Resource Management

One of DCR's core functions is the protection of natural and cultural resources. Cultural Resource Management (CMR) is carried out within the planning bureau and includes inventory, assessment, preservation and interpretation. As with natural resources, cultural resources may be negatively affected by agency actions and programs. Through good planning and compliance with applicable laws, DCR can ensure the preservation of significant cultural resources for generations to come.

Staffing

DCR employs a staff archaeologist and a several preservation planners with expertise in historic buildings and landscapes. Staff provide technical assistance and planning leadership, oversee preservation projects and regulatory review processes, conduct fieldwork and develop management plans. They are also the liaison between DCR and the State Historic Preservation Office (SHPO), which in Massachusetts is the Massachusetts Historical Commission (MHC).

Regulatory Compliance

Cultural resources are protected from state and federally funded or approved activities under several laws including, but not limited to:

- M.G.L. Ch 9 ss 26-27c as amended by St 1988 c. 254.
- M.G.L. Chapter 38, section 6B (Massachusetts Unmarked Burial law)
- Massachusetts Environmental Policy Act (MEPA)
- Section 106 of the National Preservation Act of 1966

To comply with these laws, DCR must consult with the State Historic Preservation Office whenever a state action has the potential to impact historic or archaeological resources. In Massachusetts the SHPO is the Massachusetts Historical Commission (MHC). Cultural Resource Management staff members are available to coordinate the consultation process. In planning projects and activities that are subject to MHC review, schedules must allow for a 30 day review process.

DEM (now the Division of State Parks and Recreation) executed a Programmatic Memorandum of Agreement (PMOA) with the MHC that allows for some categorical exemptions from the review process. The PMOA is managed through CRM staff.

The Baseline Inventory

CRM staff is engaged in an ongoing program of inventory, survey and evaluation of cultural and archaeological resources as well as the nomination of significant sites to the State and National Registers of Historic Places. This information is maintained in the Cultural Resource Inventory, a baseline record of cultural and archaeological resources within DCR facilities. The Inventory is used to avoid or minimize impacts to sensitive cultural resources areas as well as to identify opportunities to enhance and interpret historic sites.

Best Management Practices for Forestry

The protection of cultural resources fits well with the Massachusetts Forest Cutting Practices Act (FCPA) and its associated Best Management Practices, which if properly applied, should result in minimal soil compaction and erosion. In addition, some state agencies (e.g., the DWSP) have internal

BMPs or requirements that go well beyond the FCPA, including the requirement that low-impact logging machinery be used in certain sensitive areas. It's likely that the greatest threat to cultural resources occurs on private lands, especially when forest cutting plans are not required or are not filed.

- *Internal Review of Proposed Silviculture Projects*

Without appropriate controls, forest management programs can be detrimental to archaeological resources. Modern harvesting methods employ a wide range of heavy machinery, some of which, because of weight distribution and/or tire characteristics, can do irreparable damage to prehistoric sites. Skidding logs can further disturb the soil and associated cultural resources. Operations also entail clearing areas for landings, turn-arounds, and access roads. Those archaeological sites that lie closest to the surface can be damaged by such activities. It is these same types of sites - those that are the youngest in time (i.e., the Early, Middle and Late Woodland) - that were most susceptible to destruction by the plow of the local farmer, and thus represent a relatively scarce piece of the archaeological record.

Accordingly, the foundation of EOE's Cultural Resource Management within the broader context of the Lower Worcester Plateau Ecoregion is a process for reviewing proposed silvicultural operations. The review involves evaluating and assessing the impacts that harvesting could have on archaeological resources should they exist at any given operation.

- *Timber Sale Prescription Forms*

When appropriate (e.g., when an operation is planned for a known or predicted sensitive archaeological site), the foresters responsible for managing state forestlands within the LWP ER should submit a Timber Sale Prescription Form to a professional Archaeologist for in-house review. The form should provide a detailed narrative of the proposed operation including: location and size, description of topography, forest cover and soils, goals of silvicultural operations, equipment limitations, important plant and wildlife communities, and hydrology. Known historic features should be added to the form.

- *Site-specific Review*

The primary analytical tool employed in the review of impacts to prehistoric archaeological sites is the evaluation of site location criteria.

Prehistoric Sites

At no time in prehistory did human populations roam haphazardly and endlessly across the landscape. For approximately 12,000 years local Native American populations adapted to the changing climatic and environmental conditions around them. During this time, Native Americans adapted their tool kit and strategies in order to take advantage of the new resources and opportunities the new environmental conditions afforded.

The key criteria for determining the archaeological sensitivity of a given site include: degree of slope, presence of well-drained soils and proximity to fresh water. Other variables such as aspect, availability of stone suitable for tool-making (i.e., soapstone in Petersham, argillites in the Connecticut River Valley, quartzite and quartz throughout the LWP ER), and elevation above sea level, may also be factors. When one or more of these variables are met, the locations are considered to have been an attractive for Native American habitation or subsistence activities. They are thus potentially sensitive for the existence of prehistoric sites. Accordingly such areas are classified as highly sensitive or moderately sensitive for prehistoric resources, and specific guidelines may be required for harvesting in such areas.

Historic sites

As noted above, within the LWP ER there are several thousand historic archaeological sites, six regions that have been classified as significant historic landscapes, and over 1500 properties listed on the National Register. These types of resources typically are not as fragile as prehistoric archaeological sites, nevertheless, depending on their condition, significance and location they may require specific management strategies to ensure their protection.

- *Harvesting Restrictions and Limitations*

For those silvicultural operations that will occur in locations that have been classified as highly or moderately sensitive for prehistoric resources, restrictions are recommended on the time of year and the types of equipment and techniques used. By employing restrictions on the harvesting operations that minimize ground disturbance, a compromise is achieved that allows the harvest to occur, while affording some protection to whatever archaeological resources may lie buried below the ground.

The following are types of restrictions/limitations that may be recommended for highly sensitive areas:

- the harvest should occur during the winter with frozen soil conditions;
- skidding should not be permitted;
- chainsaw-felling and the use of forwarders for log removal may provide the best protection of sites
- where mechanical felling and processing is desired, considerations should be given to soil disturbance and compaction; e.g., three-wheeled 'tricycle' feller-bunchers may disturb the soil too much through frequent small-radius turns and high ground pressure, while tracked machines distribute machine weight and reduce compaction. Machines with extendable booms further increase options for protecting cultural resources, by reducing ground travel and compaction and allowing trees to be pulled away from cultural sites before being dropped.

For those proposed operations that are classified moderately sensitive, one or more of the above restrictions may be recommended. For those rugged upland, or previously disturbed areas that fail to satisfy the basic site location criteria, restrictions on the season of the proposed harvest or the type of equipment may not be appropriate.

In some cases, particularly with large acreage sales, portions of a lot may satisfy some, or all of the site location criteria, while other portions satisfy none. In those situations, restrictions may be recommended for the sensitive portion of the operation, while the above harvesting restrictions would not apply in the other portions.

- *Vegetation Management at Historic Sites*

Vegetation, if left to grow unchecked in and around stone foundations, and other historic structures like dams, raceways, etc., will ultimately destroy these archaeological features. Accordingly, a limited and selective program of vegetation management is recommended. This same limited program has been employed on historic sites in the former MDC Watersheds and its Reservations & Historic Sites.

Given limited resources, the control of vegetation growth in and around archaeological sites and historic buildings and structures is a high priority. The dislocation of foundation stones, and the spalling of cement caused by root activity are among the most immediate threats to some of the cultural resources of the Commonwealth.

As a recommended site stabilization and preservation technique, vegetation management should entail:

- Removal of most small to medium sized brush, saplings, and trees from on, and within archaeological features i.e., cellar holes and their foundation walls; channelized stream beds; mill dams; and historic buildings.
- Removal shall be by cutting as close to the ground as feasible. Vegetation should not be pulled, or otherwise dislodged in a manner that would affect root systems.
- Manual felling of trees may often be the best technique for removal. Where the terrain is sufficiently level and stable to support them, the use of tracked feller-bunchers may be better. These machines have a long reach that limits the need to bring equipment too close to the structure. They hold the tree as it is cut, then pick it up to remove it, thus there is no concern about the direction of the fall. Furthermore, the tracks tend to distribute the weight, thereby limiting compaction to buried deposits.

Cutting contracts should include clauses that direct the logger to take extra care and precautions around cellar holes/foundations etc.